



PHARMACEUTICAL INVENTORY MANAGEMENT PRACTICES: THE
CASE OF TIKUR ANBESSA SPECIALIZED HOSPITAL, ADDIS ABABA,
ETHIOPIA

A Thesis submitted to the Addis Ababa University, College of Business and
Economics, School of Commerce for the Partial Fulfillment of the Requirement
of the Degree of Masters of Arts in Logistics and Supply Chain Management

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Declaration

I, Eshetu Kebede declare that this work entitled “Pharmaceutical inventory management practices: The case of TikurAnbessa Specialized Hospital”, is the outcome of my own effort and study and that all sources of materials used for the study have been duly acknowledged. I have produced it independently except for the guidance and suggestion of the research advisor. This study has not been submitted for any degree in this University or any other University.

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Statement of Certification

This is to approve that the study made by Eshetu Kebedeon the topic entitled: *“Pharmaceutical inventory management practices: The case of TikurAnbessa Specialized Hospital”* is his original work and is suitable for submission for the award of Masters of Art Degree in Logistics and Supply Chain Management.

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DEPARTMENT OF LOGISTICS AND SUPPLY CHAIN MANAGEMENT

This is to approve that the study made by Eshetu Kebede on the topic entitled: “Pharmaceutical inventory management practices: The case of Tikur Anbessa Specialized Hospital “and submitted in partial fulfillment of the requirements of Master of Art in Logistics and Supply Chain Management complies with the regulations of the University and meets the accepted standards with respect to originality and quality.

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List of Acronyms and Abbreviations

AAHB	Addis Ababa Health Bureau
AAU	Addis Ababa University
AIDS	Acquired Immune Deficiency Syndrome
APTS	Auditable Pharmaceuticals Transactions and Services
ARHC	Addis Ababa Region Health Centre
ART	Anti-Retroviral Therapy
DLMS	District level management of store
EOQ	Economic order quantity abbreviations
EPSA	Ethiopian Pharmaceutical Supply Agency
FEFO	First expire first out
FMOH	Federal Ministry of Health
FP	Family Planning
HC	Health center
HCMIS	Health commodities management information system
HIV	Human immunodeficiency virus
IFRR	Internal Facility Report and Request
IM	Inventory Management
ITR	Inventory turnover ratio
JIT	Just-In Time
MSH	Management Science for Health
MoSHE	Ministry of Science and Higher Education
NLSM	National level management of store
RRF	Report and Request Form
SCM	Supply Chain Management
TASH	TikurAnbessa Specialized Hospital
TB	Tuberculosis
VEN	Vital, Essential &Non-essential
WHO	World Health Organization

ABSTRACT

Availability of pharmaceuticals is vital to the success of any healthcare programme. Effective and efficient pharmaceuticals inventory management provide accurate consumption data and enables accurate forecast of the future demands of pharmaceuticals. The objective of the study was to assess the pharmaceuticals inventory management practices and challenges of the Tikur Anbesa Specialized Hospital. Both quantitative and qualitative research approach was employed. This study followed the facility based cross-sectional descriptive study design. The sample size of the study was 138 health professionals of the hospital and proportionate stratified sampling technique was applied. Primary data was collected through questionnaire, interview and observation. Secondary data were obtained from bin cards, report and resupply form, model 19 and model 22. Quantitative data were analyzed through statistical package for the social sciences whereas qualitative data was discussed in relation with quantitative analysis. The major findings from the study were that the hospital established procedures for placing emergency orders, obsolete & expired or damaged inventories are managed according to the Disposal Guideline and the hospital uses health commodities management information system,, periodical replenishment of stocks were practiced. The study concluded that the main challenges of the hospital in managing pharmaceuticals inventories are lack of modern technologies, insufficient budget, long lead time, the length of bureaucratic systems in the procurement, lack of on job training, automated auditable pharmaceuticals transactions and services system, and integrated information sharing system. Based on the findings, the study recommends that sufficient budget needs to be allocated, relevant modern technologies needs to be applied, bureaucratic length of procurement system needs to be improved and on job training needs to be given to relevant professionals to increase availability and improve quality of health services.

Key words: Pharmaceutical inventory management, drugs, medical equipment, medical supplies, laboratory reagent

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

The availability of pharmaceuticals is very important to the success of any healthcare organization. Inventory is a stock of goods that is held by an organization or institution in anticipation of future demand (Ali,2011). Pharmaceuticals inventory is a method of maintaining stock of important drugs, medical supplies, medical equipment, radio pharmaceuticals and laboratory reagents. The effective and efficient management of pharmaceuticals inventory need management and control of important pharmaceuticals prevention of the shortages caused because of stock out and wastage due to expiry (Mursyid and Ilma, 2013).

In addition, efficient pharmaceuticals inventory management practices enable the health institutions to have an up to date inventory count at all times, giving good customer service, giving accurate information to the customers and improve service quality as well as the patient care of the health institutions. In addition, strong inventory management system allows managers to receive accurate and timely information on inventory which assists management to accurately made informed decisions so that save time and cost used for labor working on inventory management (WHO, 2016).

Furthermore, to be successful the health facilities need to ensure the availability of pharmaceuticals such as drugs and medical supplies. Pharmaceuticals are necessary in diagnosis, prevention, mitigation, treatment of diseases in the health care institutions. A reliable and consistent supply of these pharmaceuticals to health facilities at all levels of the health system will determine the success of these nationwide programmes (Kamau,2015).

(Santhi and Karthikeyan, 2016) suggested that efficient inventory control techniques enable the optimize use of resources and eventually support improve patient care, by ensuring the availability of essential stocks and preventing stock-outs and overstocks. The effective pharmaceuticals inventory management operates through close follow up of important drugs and the priority setting in purchase and the distribution of drugs. Therefore, it is essential that the health managers use scientific methods to achieve management of pharmaceuticals inventory and patient satisfaction.

Uthayakumar & Priyan(2013) stated that the pharmaceutical inventory management challenges in health care organizations include holding cost, stock out, overstock and wastage of resources. Current healthcare is more sophisticated, more complex, and it is hoped to be more effective. Increase in costs of hospital care, modern technology, inflation, increasing demands and expectations of public are necessitating the development of financial policies and mechanisms.

Manhasetal (2012) suggested that the rising cost of the health care has become a matter of great concern all over the world and approximately 35% of the annual hospital budget is spent on buying pharmaceuticals. Pharmaceuticals consume a major portion of the hospital budget. Okoro(2016) indicated that there is a significant relationship between good inventory management and organizational effectiveness. Inventory management has a significant effect on organizational growth. There is a highly positive correlation between good inventory management and organizational success. The study concluded that Inventory Management is very vital to the success and growth of organizations.

Proper management of the stock has paramount importance for any organization, running a hospital is no exception because without plenty of stocks, health services to patients will be compromised. Maintaining optimum stocks of pharmaceuticals enables health facilities to render expected services to the patients and use resources wisely by reduction of costs and wastages mainly through expiry. In addition, holding optimum inventory reduce disposal costs of expired pharmaceuticals(Yiggit, 2016).

1.2 Statement of the Problem

At the various level of the pharmaceutical supply chain maintaining appropriate inventory level is crucial to ensure sustainable supply. Too little inventory often hinders business operations, and enhance the likelihood of poor customer service. On the other hand, too much inventory consumes physical space, creates a financial burden, and increases the chance of expire, damage, spoilage and loss (Shiau,2017).

The main challenges in healthcare supply chain management include balancing demand with the supply and balancing costs with the right amount of inventory to sustain quality and timely patient care (Gebicki etal,2014). Furthermore, in a hospital, the consequence of a stock-out is far more severe because stock-out in the hospital endanger patient's life compared to other industries where a stock-out typically results in lost revenue. Therefore, inventory management affects the supply chain management, as it ensures cost containment,

supply chain effectiveness, supply chain efficiencies and customer satisfaction (Toba, Tomasine&Yang ,2008).

Farizaet al (2015) indicated that all types of wastage including overstocking, pilferage and expiry need to be managed efficiently. This wastage reduces the quantity of pharmaceuticals available to patients and therefore hinders the quality of health care delivery. Under stocking, overstocking and expiry of pharmaceuticals reflect problems within the pharmaceutical supply chain activities which include selection, quantification, procurement, storage, distribution and use.

The literature review of most of the studies conducted on pharmaceutical inventory management practices and challenges was on cost minimization and reduction of wastages one specific area and only on a single facility only. There is no insight on the pharmaceutical inventory management practices and challenges with respect to inventory control, reasons of stock out, quality health services, aspects of inventory management needed to be practiced.

There is no study conducted on the pharmaceutical inventory management practices and challenges in TASH and as well as other hospitals in Ethiopia. In TASH there is high amount of processed order lines and amount of stock keeping units, these inventory recordings and report generations, in this nationwide, the burden of using manual methods are the among the problems observed.

TASH is a service rendering institution and one that keeps stock to facilitate operations. To meet the expectations of the people, one can think of how to control inventory in the hospitals to ensure availability of medical supplies at the right time and at their right quantity in order to avoid expiry of drugs and misuse of the supplies. The resources are limited and hence the need to find the efficient operation demands a planned flow of pharmaceuticals possible and effective ways of reducing cost of purchase and the cost of holding inventory.

Furthermore, in TASH it is observed that there are grievances by patients that the drugs are not available to them from the hospital pharmacy services. The focus of this research is to assess and understand systematically the pharmaceutical inventory management practices and challenges in TASH since frequent stock out of drugs, expires of drugs, laboratory reagents, lack of safety stocks of medical equipment are observed as major problems in the TASH pharmaceutical inventory management. It has been observed that there are stock depletions and shortages of pharmaceuticals at the service delivery point, and clients complain about the service in TASH.

1.3 Research Questions

Based on the research background and motivation, this research attempts to address the following research questions:

1. How does Tikur Anbesa Specialized Hospital manage and control the flow of stock and information of pharmaceuticals?
2. What are the causes of stock out of pharmaceuticals at Tikur Anbesa Specialized Hospital?
3. What are the aspects of pharmaceutical inventory management practices that need to be considered in TASH?
4. What are the challenges related to managing inventory of pharmaceuticals at Tikur Anbesa Specialized Hospital?

1.4 Objective of the Study

1.4.1 General Objective of the study

The general objective of the study is to assess pharmaceutical inventory management practices and challenges at TASH.

1.4.2 The specific objectives of the study are:

1. To assess the inventory management and control of the flow of stock and information of pharmaceuticals practiced by Tikur Anbesa Specialized Hospital
2. To identify the causes of stock out of pharmaceuticals at Tikur Anbesa Specialized Hospital
3. To identify the aspects of pharmaceutical inventory management practices that need to be considered at Tikur Anbesa Specialized Hospital
4. To assess challenges related to inventory management of pharmaceuticals at Tikur Anbesa Specialized Hospital

1.5 Significance of the Study

The findings of the research are expected to contribute a lot for different stakeholders. This study is designed to address pharmaceutical inventory management practices and challenges at Tikur Anbesa Specialized Hospital and proper corrective action measures to strengthen pharmaceutical inventory management system since health product inventory management in hospitals is full of many problems. Poor inventory management decreases response and

interventions of health facilities to the healthcare needs of the population and reduce the quality of patient care so that unable to save lives.

The study is come up with appropriate suggestions on the aspects of pharmaceutical inventory management practices that need to be considered in TASH. It also gives some highlights to policy makers for decision making, governmental and nongovernmental organizations working in this area to focus on the problem and be involved in efforts to improve in their inventory management. In addition to this, the study will be useful to researchers to undertake further research into the area of inventory management in the public sector.

1.6 Scope of the Study

The geographic scope of this study is limited to only on one hospital/ Tikur Anbesa Specialized Hospital/ in assessing the practices and challenges of pharmaceutical inventory management in Addis Ababa. Private health facilities and other governmental facilities will not be included in the study so that the result from the study might not be representative of other hospitals. The data collected from pharmacists, laboratory technologists and heads of departments or wards was used to measure the inventory management practices and challenges of medicines, medical supplies, medical equipment and laboratory reagents. Pharmaceutical inventory management related records and reports were reviewed during the assessment.

1.7 Limitation of the Study

The study only focuses on a single hospital in Addis Ababa under FMOH and Ministry of Science and Higher Education (MoSHE). There are only limited numbers of pharmaceutical inventory management in similar study especially in Ethiopia which made it difficult for comparing results. In addition, budget constraints and material resources were the challenges that limit the depth of coverage of the research work.

1.8 Operational definition of Terms

Inventory management: -The process of efficiently overseeing the constant flow of units into and out of an existing inventory

Pharmaceuticals: are all medicines, laboratory reagents, medical supplies and medical equipment

Inventory: - the stock of products retained to meet future demand

Stock out: -Depleted supply of a given product; a zero-stock balance.

Overstock: - A supply imbalance that occurs when stocks exceed the established maximum level may result in losses due to expiry.

Stock card: -A generic name for an inventory control card

Bin card: -Which records received or issued data

The lead time: -is the time period between the placement of an order and delivery is one of factors which influence the customer satisfaction

Public Health Facilities: are hospitals and health centers owned by government

1.9 Organization of the Study

This research paper is organized into five chapters. These chapters are constituted as follows.

Chapter -1 Introduction: In the first chapter all introductory parts of the study like background of the study, problem statement, research question, objective of the study, conceptual frame work, significant of the study, delimitation and limitation of the study, as well as conceptual definitions are included.

Chapter -2 Literature review: The second chapter of the study comprises the theoretical framework, which is a compilation of other author's journals and articles, literature about the pharmaceuticals inventory management practices and challenges. This section also includes a review of various empirical studies that have been made on this topic.

Chapter -3 Research methodologies: The methodology part of the proposal represents the processes to mapping out the study area, research design, target population, method of data collection and research instruments, methods of data analysis and ethical consideration.

Chapter-4 Result and Discussion: Findings on pharmaceuticals inventory management practices and challenges at TASH

Chapter-5 Summary of Findings, Conclusions and Recommendations: The Conclusions drawn from the research findings and recommendations to solve problems of pharmaceuticals inventory management of TASH

CHAPTER TWO

RELATED LITERATURE REVIEW

2.1 Theoretical Review

2.1.1 Definition and Concept of Inventory

Piasecki (2009) defined the term inventory as a stock or store of goods. These goods are kept on hand at or near a business's location so that the firm may meet demand and fulfill its reason for existence. Stock and Lambert (2001) defined inventory as the stock of any item, product or resource used in an organization or institution. Shadrack, Dominic & Lilian (2015) also defined inventory as raw materials, work- in- progress, finished goods and supplies used for creation of a company's goods and services.

In addition, Uthayakumar&Priyan (2013) defined inventory as an idle stock of physical goods that contain economic value, and are held in various forms by an organization in its custody awaiting packing, processing, transformation, use or sale in a future point of time. Inventory include inputs such as financial, energy, human, equipment, and physical items such as raw material; inputs such as parts, components, and finished goods; and interim stages of the process, such as partially finished goods or work-in-progress. Inventories are the physical resources that a firm holds in stock with the intent of selling it or transforming it into a more valuable state.

In pharmaceutical supply chain operations, inventory is defined as the stock of pharmaceutical products held by an organization or institution to meet future demand. It is a detailed list of pharmaceuticals held by organization or institution which represents the largest asset in pharmacy practice. It is a method of maintaining stock of pharmaceuticals to satisfy patients' demand. At different points in the pharmaceutical supply chain there is inventories of pharmaceutical products (Ali,2011).

2.1.2 Inventory management

Inventory management is defined as the continuous process of planning, organizing and controlling inventory that aims at minimizing the investment in inventory while balancing supply and demand. It is an important component of the pharmaceutical supply chain. It aims at reducing procurement and carrying costs, while maintaining an effective stock of pharmaceuticals to satisfy customer and prescriber demands. Managing pharmaceutical

productsthroughinventorymanagement is an integral part of the business and service model for all pharmacy settings, especially community and hospital practices (Ali, 2011).

Kumurya(2015) suggested that inventory is controllable and the pharmacy department normally decides how much inventory investment to make, when to reorder, and in what quantities. Accurate and updated stock records are essential to good inventory management. They are the sources of information used to calculate the needs, and inaccurate records produce inaccurate needs estimations and leads to the problems of stock outs and expiry. Therefore, good pharmaceutical inventory management has great contribution in reducing the cost of purchasing pharmaceuticals.

In addition, Maharaj, D'Souza, Rishma&Doodh(2012) defined inventory management as policies, procedures, and techniques employed in maintaining the optimum number or amount of each inventory item. The purpose of inventory management is to provide uninterrupted production, sales, and/or customer-service levels at the minimum cost.

Pharmaceuticals inventory management guides the health facilities how much stock is available, what to order, when to order more stock, when to issue, how much to order or issue, and how to maintain an appropriate stock level of all pharmaceuticals to avoid shortages or overstock. All these activities are tracked with appropriate documentation, thus good record-keeping is critical (WHO/AFRO/JSI SW, 2009).

In addition, Efficient inventory management plays a great role in pharmacy practice from both financial and operational perspectives. From financial perspectives efficient inventory management enhances gross profits and net profits by reducing the cost of procured pharmaceutical products and associated operational expenses in inventory (Santhi and Karthikeyan, 2016).

Inventory management focuses at reducing procurement and carrying costs, while maintaining an effective stock of products to satisfy customer and prescriber demands. The effective and efficient pharmaceutical inventory management enables the organizations to focus on close supervision of important pharmaceuticals, prevention of the pilferage and priority in purchase and distribution of drugs and would help the optimize use of resources and eventually help to improve patient care, by ensuring the availability of essential stocks and preventing stock-outs(Ali, 2011).

Furthermore, inventory management is vital for pharmaceutical supply system which involves the management of routine pharmaceutical ordering process. It helps to maintain a steady supply to patients, hence preventing product stock out, while minimizing the costs of holding inventory. Proper pharmaceutical inventory controls maintain and establish effective inventory records and procedures that are basis to protect against theft and corruption. In addition, the inventory control system is used for requisitioning, issuing pharmaceuticals, preparing the consumption data that can be used for forecasting, for preparing the consumption and stock balance reports necessary for procurement. Pharmaceutical stock record keeping should be sufficiently detailed to provide an audit trail that accurately traces the flow of pharmaceuticals and budgets through the pharmaceutical supply chain (MSH, 2012).

Enough inventories enable the organization to satisfy the demands of its customers but when stock out occur it can't satisfy the demands of its customers and it is a challenge to the organizations to achieve their objectives. However, the company does not want to have too much inventory staying on hand because of the cost of carrying inventory. Inventory decisions are high risk and high impact for the supply chain management of an institution. Inventory management practices have come to be recognized as a vital problem area needing top priority (Pokhariya and Mathur ,2018).

In addition, the cost of maintaining the average inventory investment of inventory in the pharmaceutical supply chain is the carrying cost of pharmaceutical inventory. The costs incurred in carrying inventory include costs such as; rent and utilities, insurance and taxes on inventory etc. It is the amount of money it costs to maintain on dollar's value of inventory for a specified time (Mursyid&Ilma,2013).

Generally, a good inventory management and control system result in minimized inventory investment, appropriate customer service level, balanced supply and demand, minimized ordering cost and holding cost; also preservation of inventory control system (Pokhariya and Mathur ,2018).However, poor inventory management leads to wastage of financial resources, overstock of pharmaceuticals, shortage of essential medicines, and a decrease in the quality of patient care (Moons, 2018).

2.1.3 Types of Inventory

According to Stock and Lambert (2001) inventories are categorized into six major types as listed below:

2.1.3.1 Cycle Stock

It is the inventory that is needed to meet demand under conditions of certainty and it results from the replenishment process. This type of inventory is needed when the organization can predict demand and replenishment times that is the lead times perfectly (Stock and Lambert, 2001).

2.1.3.2 Buffer or Safety Stock

Stock and Lambert (2001) explained that it is the stock kept in excess of cycle stock as a result of uncertainty in demand or lead time. Safety stock is the technique that is used by management to control inventory level along with continuous review policy and economic order quantity. Chopra & Meindl (2013) suggested that calculating safety stock require customer service level.

2.1.3.3 Pipeline (In-Transit Inventory)

It is the inventory that is on the way from one location to another. In spite of the fact that it is not available for sale and or shipment until after it arrive at the destination, it may be considered part of cycle stock (Stock and Lambert, 2001).

2.1.3.4 Speculative Stock

Stock and Lambert (2001) indicated that it is the inventories purchased because of speculations of price hikes rather than satisfying the current demand.

2.1.3.5 Seasonal Stock

It is a form of speculative stock that it involves the accumulation of inventory before a season begins in order to maintain a stable labour force and stable production runs. Inventory accumulated as a result of a growing season that limits availability throughout the year such as in the case of agriculture products (Stock and Lambert, 2001).

2.1.3.6 Obsolete (dead) Stock

Stock and Lambert (2001) explained that it is the set of items for which no demand has been registered for some specified period of time. They are deteriorated, out of date or no longer useful due to advancements in technology.

2.1.4 Advantages of inventory in public hospitals

Usha Pokhariya and Prashant Mathur (2018) suggested that the basic reason for holding inventory is to keep up to the services and production activities unhindered. At the time when the stocks are required it not physically possible and economically justifiable to wait for the

stocks. Therefore, keeping of inventory is necessary for the efficient working of an organization.

Globerson and Wolbrum(2014) outlined that inventory enables the institutions to use the capital and to provide sustainable services, increase profitability, predict the impact of corporate policies on inventory levels, and to minimize the total cost of logistic activities. Inventory managers need to determine which items to order, how much inventory to order and when to place the order.

Manhas et al (2012) explained that the health care in modern days has become more sophisticated, complex and more expensive in terms of cost of pharmaceuticals and hospital stay. Pharmaceuticals inventory management optimize the costs of Medicare services besides making available materials to the patients which increase the quality of health care services. The hospital management has to ensure the availability of various pharmaceuticals round the clock as these are essential and vital for patient care. The pharmacy departments are most often charged with responsibility for managing pharmaceuticals inventory and delivery system costs. The pharmacy management team need to focus on developing effective strategies to optimize pharmaceuticals inventory.

Inventory provides five benefits in an organization (Stock and Lambert, 2001). These benefits include protection from uncertainties in demand and order cycle, enabling the institution to achieve economies of scale, balancing supply and demand, and acting as a buffer between critical interfaces within the supply chain.

2.1.4.1 Acts as a Buffer

In order to minimize the outcome of errors in forecasting the lead time or the demand during the lead time buffer stock is necessary (Tech Blog, 2013). Buffer stock is needed when there is a delay in product arrival due to long lead time or supply chain change over time.

2.1.4.2 Balancing Supply and Demand

Ali (2011) explained that at the time of the seasonal supply and or demand, it may be important to hold inventory. In the public hospitals the pharmacy department ensures effective inventory management so as to meeting customer and patient demands. When the needed pharmaceuticals are not available at the time they are needed they may cause the community pharmacy to lose a customer and predisposes inconvenience to the prescribing physician; and may adversely affect patient's wellbeing in hospital pharmacy settings and

reduces the quality of patient care, affect treatment outcome, especially when the product is an essential lifesaving one.

2.1.4.3 Protection from Uncertainties

Holding inventory improves customer service levels through reduction of the chances of stock out because of unexpected demand or variability in lead time. Institutions held inventory in order to protect from uncertainties to provide sustainable services. Increased inventory investment would make the institution to achieve higher levels of product availability and less chance of a stock out (Stock and Lambert, 2001).

2.1.4.4 Economies of Scale

In order to achieve economies of scale in purchasing, transportation and manufacturing the institutions need inventory. For instance, raw materials inventory is necessary if the manufacturer is to take advantage of the per unit price reductions associated with purchases. However, increasingly when purchase volumes are sufficiently large, purchase contracts are been negotiated based on annual volumes not the amount purchased on an individual order. Purchase materials have a lower transportation cost per unit if ordered in larger volumes. The reason for this lower per unit cost is that full truckload and railcar shipments receive lower transportation rates than smaller shipment of less than truckload or less than carload quantity (Stock and Lambert, 2001).

2.1.5 Inventory Costs

UshaPokhariya and PrashantMathur (2018) suggested that in pharmacy practice inventory-associated costs includes: acquisition costs, procurement costs, carrying costs, and shortage costs. Acquisition cost is the net amount of money the pharmacy pays for the products. Procurement costs are concerned with the costs associated with purchasing of the products, which include placing and receiving orders, stocking and paying invoices. Carrying costs deals with the costs associated with product storage, which also include costs induce as a result of crisis, e.g. theft or damage. Shortage costs, is also known as stock-out costs, that are having the costs of not having the product on the shelves when needed.

In addition, the costs of holding stock need to be considered with the benefits to be gained. The practical method is calculating the inventory turnover rate (ITOR), which can be determined for the whole pharmacy stock, or specific department (e.g. medical equipment products), or a specific individual product. The ITOR is computed as the ratio of the cost of

products sold to the average inventory. Average inventory is calculated by averaging beginning inventory and ending inventory values during a specified period of time. The higher ITOR values indicate the inventory was quickly purchased, sold, and replaced within that specific time interval. However, lower ITOR values indicate the products were sitting on the shelves and not being dispensed and poor management of pharmacy inventory (Ali 2011).

2.1.6 Pharmaceutical inventory management practices

Pharmaceutical inventory is the stock of pharmaceutical products retained to meet future demand in pharmacy operations. Pharmaceutical inventory is used to ensure availability of pharmaceuticals when patients need them and to keep the pharmaceutical cost at a minimum. Inventory supports order fulfilment and customer service. Properly managing stock by using pharmaceuticals before they expire and processing returns regularly can help keep medication cost down. Efficient inventory management plays a great role in pharmacy in both financial and operational perspectives (Santhi and Karthikeyan, 2016).

Furthermore, Ali (2011) suggested that the main focus of the pharmaceutical inventory management in the hospital inventory management and the healthcare supply chains is to minimize the healthcare cost without compromising the quality of the patient care by improving the effectiveness, efficiency and productivity of the healthcare system.

Piasecki (2009) explained that inventory has important role for success in many organizations. They further suggested that inventory plays a dual role in an institution. Inventory impacts the cost of sales as well as supports order fulfilment and customer service. Pharmaceutical inventory management is very important for pharmaceutical supply chain since it involves the management and the active control of routine pharmaceutical ordering process and maintains an optimum pharmaceutical supply to patients, hence preventing product stock out, while minimizing the costs of holding inventory.

In addition, Mahyadin et al (2015) suggested that pharmaceutical inventory management deals with ordering, receiving, storing, issuing and reordering of pharmaceuticals. The stock records are the core records in the inventory management system. The stock records can be either manual or computerized. Internal Facility Report and Resupply Form (IFRR) and Report and Requisition Form (RRF), Bin Card, Stock Record Card are common inventory recording and documentation formats in pharmaceutical inventory management. These records are called inventory or stock records. These records are sources of basic and primary information for inventory management in that they contain all transactions of each

pharmaceutical. They are source of information on pharmaceuticals inventory receipts, issues, losses, orders and balances, suppliers, customers and prices and this information is used to compile and generate performance reports and various reordering formulas respectively. The information inferred from them is essential for pharmaceutical selection, planning forecasting, quantification and distribution.

Furthermore, Globerson&Wolbrum (2014) outlined that effective management of inventory is vital for the successful operation of most organizations. Organizations should effectively and efficiently manage their inventories. In inventory management there are two main concerns. First, inventory management concerns the level of customer service, that is, to have the right goods in sufficient quantities, in the right place, at the right time and pharmaceuticals of the right quality. The second concern is the cost of ordering and carrying inventories. Public health facilities are facing challenges of frequent stock outs of pharmaceuticals leading to services interruptions and overstocks leading to expiry and wastages of resources.

2.1.6.1 Pharmaceutical inventory management techniques

Gupta (2007) explained that the pharmaceutical inventory management is concerned with the tracking and management of pharmaceuticals which includes the monitoring of health commodities moved into and out of medical store locations and the reconciling of the inventory balances.

Among the different proven techniques that can be used as inventory management techniques, ABC and VEN analysis are commonly selected in public hospitals. These techniques are used to reduce the costs of supplying and enhance optimum holding of stocks of pharmaceuticals. ABC and VEN Analyses are used for setting priorities and provide information used to establish cost saving and improve efficiency of drug availability. While the ABC Analysis categorizes drugs according to their economic value of individual drugs the VEN Analysis categorizes drugs according to their health impact on individual drugs. Both analyses are often used when selecting drugs to be purchased for a health care organization (WHO, 2005).

ABC Analysis

This technique assigns pharmaceuticals into three groups according to the relative impact or values of the items that makes up the group. This concept was launched in 1920 by Vilfredo Pareto. The ABC Analysis categorizes pharmaceuticals into three classes. The pharmaceuticals that are thought to have the greatest impact, or value (high dollar value), for

instance, constituted the 'A' group, while those items thought to have a lesser impact or value were included in the 'B' and 'C' groups respectively. In spite of the fact that in many ABC analysis the focus of most management is on the 'A' items, 'B' and 'C' items are also important respectively (Gupta et al, 2007).

"A" constitutes pharmaceuticals items with a high dollar consumption value. "A" Items usually include 10-20% of all pharmaceuticals inventory items, and account for 70-80% of budgets spent on them from total consumption dollar value. "B" constitutes pharmaceuticals that are 30-40% of all inventory items and account for 30-40% of all total dollar consumption value of the inventory items. These are important, but not critical, and do not pose sourcing difficulties. "C" constitutes minor pharmaceuticals that account for 60-80% of all inventory items, but only 5-25% of budgets spent. These are standard, low cost and readily available pharmaceuticals (Gupta et al, 2007).

In spite of the fact that in many ABC analysis the focus of most management is on the 'A' items 'B' and 'C' items are also important respectively. All categories of the pharmaceutical inventory are important but inventory must be categorized or classified in accordance to their relative impact or value and treated differently (WHO, 2003).

The purpose of ABC Analysis is to identify these groups so that they can be handled in different ways according to their importance. This classification is used to ensure that purchasing staff use resources to maximum efficiency by concentrating on those items that have the greatest potential savings. Selective control will be more effective than an approach that treats all items identically. The major pro of ABC analysis is that it identifies those medicines on which most of the drug is spent and a major con is that it cannot provide information to compare medicines of differing efficacy (WHO, 2003).

VEN Analysis

This technique was first applied in a National Pharmaceutical Program in Sri Lanka. The VEN analysis has three categories which include vital, essential and non-essential (WHO, 2005). Vital pharmaceuticals include potentially lifesaving, crucial to provide health care services, significant withdrawal side effects and those pharmaceuticals without which the hospital cannot function. Essential pharmaceuticals are essential items without which an institution can function but may affect the quality of healthcare services. They are effective against less but nevertheless significant forms of illness. Non-Essential pharmaceuticals are non-essential pharmaceuticals that unavailability cannot interfere with functioning of the health

facility. These are drugs for normal usage, for minor, self-limited illnesses, drugs of questionable efficacy or with high cost for marginal therapeutic advantage (Gupta et al, 2007).

The purpose of VEN analysis is to give priority to essential, lifesaving drugs as opposed to expensive, non-essential items. The pharmaceutical supply chain managers need to assign each pharmaceutical to category of vital, essential and non-essential. A pharmaceutical assigned to non-essential category does not mean it is no longer on the system's pharmaceuticals list (Gupta et al, 2007).

The control measures for expensive drugs have resulted in 20% savings. The ABC matrix has been determined to be the most suitable for pharmaceutical inventory in hospitals (Gupta et al, 2007).

Economic Order Quantity (EOQ)

It was developed by F.W Harris in 1915 has been the most commonly used in practice. It derives the optimal lot size for purchasing by minimizing the total operating cost. EOQ helps inventory manager to determine how many optimum products to buy. EOQ model must be modified in a real inventory system analysis (Rachmamanian & Basri, 2012)

Economic Order Quantity (EOQ) is the technique that is used to minimize the total cost of inventory through the following methods; the first is when an item should be re-ordered that is reducing the resulting replenishment cost and the second is how much should be re-ordered that is reducing the carrying cost. This model depends on three basic assumptions; the first is that the firm knows with certainty the annual usage of a particular item of inventory; the second is that the rate of usage of inventory does not vary over time; and the third is that the orders placed to replenish the inventory are received at exactly the point in time when inventory is zero (Moons et al, 2018).

The inventory control methods include; open-to-buy budget method which emphasis is on financial control where a certain amount of money is allocated for the purchase of goods over a specified period of time, short-list method which is based on providing accurate and timely inventory information to the person responsible for orders, minimum and maximum method is used to determine how much & when order each item and the stock record card method which is used to record information on the movement of goods in and out of the store. Best inventory control system would consist of combining all above stated methods but it should be considered that each of these come with both pros and cons (Maharaj et al, 2012).

Santhi and Karthikeyan (2016) asserted that an inventoryEOQ in conjunction with ABC it has been proposed to be effective, efficient and the inventory management of pharmaceutical is improved at a hospital.

2.1.7 Stock and Information flow of Pharmaceuticals in public Hospitals

In Public hospitals it is necessary to manage the pharmaceutical supply chain following an integrated perspective, capable to overcome boundaries between professional specializations and organizations involved in the pharmaceuticals flow from warehouses to wards to optimize the inventory control and reduce the material handling costs of pharmaceutical products (Ramaa &Subramanya, 2012).

In the pharmaceutical supply chain management of Ethiopia logistics information is collected and reported regularly. Information flows through RRF from the Hospital to EPSA and IFRR from dispensing units to the hospital pharmaceuticals' store (SOP Manual, 2011).

Teshome D (2017) explained that the health commodity management information system (HCMIS) in Ethiopia is an open source, custom software solution and it was developed in Ethiopia for the country's health commodity supply chain by USAID | DELIVER PROJECT. It was first developed and deployed in 2009 to manage inventories in health facility pharmaceutical stores. It was adapted in 2010 for the Pharmaceuticals Fund and Supply Agency (PFSA) in order to use in its network of distribution hubs. Core team of local programmers continues to support the system's evolution, and the team provides help desk services for user and administrator support.

According to Toba et al (2008) effective and efficient flow of pharmaceutical inventory in pharmaceutical supply chains is one of the key factors for success. The challenge in managing inventory is to balance the supply of inventory with demand. A company would ideally want to have enough inventories to satisfy the demands of its customers- no lost sales due to inventory stock-outs. On the other hand, the company does not want to have too much inventory staying on hand because of the cost of carrying inventory. Enough but not too much is the ultimate objective. Inventory management efficiency is ever the means of conducting public sector and it facilitate continued flow of pharmaceuticals.

Internal Facility Report and Resupply Form (IFRR) and Report and Requisition Form (RRF), Bin Card and Stock Record Card are sources of the information of pharmaceuticals flow. These stock records contain the information that is used to compile and generate performance reports, consumption data and various reordering formulas respectively. The information

inferred from them is essential for planning selection, quantification, forecasting, procurement and distribution. Hence, they are at the center of pharmaceuticals inventory management system (Ramaa & Subramanya, 2012).

2.1.8 Stock outs of pharmaceuticals

Stock out of pharmaceuticals occurs when the needed or requested pharmaceuticals are not available on hand. It hinders the health care services and reduces the accessibility and quality of patient care. Chopra and Meindl (2003) suggested that pharmaceutical inventory plays a significant role in a pharmaceutical supply chain to achieve high level of responsiveness by locating large amounts of inventory close to the customer. In addition; inventory plays a very important role in an organization to avoid stock-out costs and the costs of being out of inventory. This is very necessary to all institutions, especially in the healthcare delivery where delay by a few seconds can cost a life. Rachmamanian & Basri (2012) explained that pharmaceuticals' selection, quantification, forecasting and procurement affect the stock out of pharmaceuticals.

2.1.8.1 Selection

Selection of pharmaceuticals involves reviewing the prevalent health problems, identifying treatments of choice, and deciding which pharmaceuticals will be needed and required to be available at the health facility. Selection enables health facilities to have limited pharmaceuticals list which has enormous advantage in supply chain management of pharmaceuticals (JSI, 2011, EPSA, 2016). This includes easier procurement, lower amount of stocks, improved quality assurance and easier dispensing among others. In Ethiopia, all health facilities expected to develop their facility specific medicines list (EPSA, 2016). All health facilities are expected to develop their own facility-based list of pharmaceuticals.

In addition, product selection is concerned with defining which products are procured and used in the health system and ranges of products that the customers can receive. Product selection process is based on the local policies and guidelines. Products are selected from or become part of a national essential medicines list (EML) and are based on standard treatment guidelines (STGs); products must be registered for overall use in-country (Mursyid & Ilma, 2013).

2.1.8.2. Quantification

Quantification is the process of estimating the quantity and cost of the pharmaceuticals that are needed for a specific health program (or service), and, to ensure an uninterrupted supply

for the program, determining the required quantity of the pharmaceuticals that need to be procured and distributed. Quantification is necessary for informing supply chain decisions for financing, procurement, and delivery. In addition, quantification affects the stock out of pharmaceuticals since it is a critical supply chain management activity which should be executed in a regular manner depending on the demand of the health facilities (Shadrack M et al, 2015).

2.1.8.3 Forecasting

Health facility maintain and provide pharmaceuticals demand data which is of high-quality data that can be used as an input for more accurate forecast outputs (PFSA, 2013). The demand pattern of items requested is characterized by infrequent demands, often of variable size, occurring at irregular intervals. Health facilities are required to forecast their need by using appropriate techniques by estimating the quantity and cost of each product that will be dispensed or used for the next year and adjust their expected budget. In pharmaceutical inventory program pharmaceutical quantification is managed in centralized way. This includes programs like ART/HIV test kits, TB, FP, Malaria and Vaccines. Thus, health facilities are the main source of data (EPSA, 2016).

2.1.8.4. Procurement

The pharmaceuticals supply chains procure the required quantities of pharmaceuticals quantified need to be procured. Health systems or programs can procure from local, regional, and international sources of supply. Procurement need to follow a set of specific procedures that ensure an open and transparent process that supports the six rights, at the right cost, right at the quality, at the right product, at the right quantity, at the right place, at the right time (Mursyid & Ilma, 2013).

Program pharmaceuticals procured by EPSA centrally and distribute for health facilities based on their requests. Health facilities should procure budget drugs preferentially through PFSA, products which are not found at PFSA can be procured from private suppliers using stock out certificate (EFSA, 2013).

2.1.9 Aspects of pharmaceutical inventory management practices that need to be considered in public hospitals.

Hospitals are complex organisations providing large number of services for patients by health professionals and other supportive staff. Health care managers must be able to manage the inventory of pharmaceutical inventory effectively. An additional quantity of stock kept in

inventory is used to protect against unexpected fluctuations in demands and supply. If demand is greater than forecast or supply is late, a stock shortage will occur. Safety stock is used to protect against these unpredictable events and prevent disruptions in the hospital (Ramaa & Subramanya, 2012).

The appropriate or optimum level of stock or inventory that an organization should keep or store must help to provide services and reduce the cost. Pharmaceutical inventory management can make it easy and effective and reduces pharmaceutical handling time and counterfeiting of the pharmaceutical products up to a high rate (Wang, 2010).

There are two main goals for managing an inventory for a pharmacy. The products that are regularly kept in stock are based on the demands of the pharmacy and its customers. Efforts should be made to maintain the pharmaceuticals used regularly in stock and available for use not outdated or damaged, while some rarely used, extremely expensive or cumbersome pharmaceuticals may be ordered in as needed. The second goal of inventory management is to keep pharmaceuticals costs at a minimum. In order to decrease the cost of purchasing pharmaceuticals organizations prefer wholesalers to order from or contract pricing with specific drug companies. Preventing profit loss is also a contributing factor to controlling pharmaceuticals costs. Properly managing stock by using pharmaceuticals before they expire and processing returns regularly can help keep pharmaceuticals cost down (Ramaa & Subramanya, 2012).

By classifying each pharmaceutical into A, B, or C the hospital pharmacy manager needs to determine the resources in terms of time, effort and money to dedicate to each item. Attention should be paid to the management of expensive drugs by allowing the top management taking part in the decision of how much of them the hospital can stock so that limited capital is held in pharmaceutical stocks (Gupta et al, 2007).

By considering both VEN analysis and ABC analysis effective and efficient pharmaceutical inventory control can be practiced. ABC-VEN inventory matrix analysis is created, by combining the ABC and VEN analysis. By cross-tabulating of these analysis nine different subcategories (AV, AE, AN, BV, BE, BN, CV, CE, and CN) are obtained. ABC-VEN matrix provides more meaningful control over the pharmaceutical supplies and divides items into three main categories: Category I, Category II, and Category III. Category I items consist of vital and expensive. It consists of six subcategories (AV, BV, CV, AE, and AN). In addition,

it needs control by top of management. Category II includes essential with low cost items (BE, CE, BN). Category III consists of the desirable with least cost items (Gupta et al, 2007).

ABC-VED analysis is useful for medical materials need highest attention and strict control for effective and optimal use of funds and prevent stock-out situations of items store (Vahit, 2016).

In addition, pharmaceutical inventory management requires planning, designing and organizing of the medical stores. An inventory control technique in the healthcare provides significant improvement in patient care, customer relationships and optimal use of resources. Hospitals allocate high budgets to procure pharmaceutical items (Ramaa & Subramanya, 2012).

Information technology can be employed in pharmacy operations to improve inventory management, control and evaluation by reducing procurement costs and protecting against inventory shrinkage because of wastages. In addition, the potential for pharmaceuticals supply chain monitoring and problems of pharmaceutical inventory tracking is further curtailed when product barcode scanning is employed in pharmacy practice, especially in hospital pharmacy settings (Wang, 2010).

2.1.10 Pharmaceutical Inventory Management Challenges

Santhi and Karthikeyan (2016) stated that pharmaceutical is one of the most sensitive products and that deals with human and animal life. Purity is highly deserved in this product. Pharmaceuticals' quality, security, identity should be maintained. Pharmaceuticals inventory management challenges includes insufficient storage, expired of pharmaceuticals, constraint of budget, stock out and overstock of pharmaceuticals. In both financial and operational perspectives, the efficient inventory management plays a great role in pharmacy. From financial viewpoint, efficient inventory management enhances gross profits and net profits by reducing the cost of procured pharmaceutical products and associated operational expenses in inventory. There are three types of costs associated with inventory in pharmacy. These are procurement costs, carrying costs, and shortage costs.

The overstocked pharmaceutical inventories accumulated takes up additional space in the warehouse and the hospital incurs additional holding costs in order to take care of the inventories. There is a chance to inventory discards to occur to those inventories that are prone to experience quality deterioration or have a short shelf life so that it adds disposal costs (Mursyid & Ilma 2013).

Furthermore, expiry and stock out of vital pharmaceuticals are substantial; poor inventory control system is the main reason for wastage and shortage of essential pharmaceuticals due to stock-outs that would occur due to poor inventory control. On the other hand, the leading causes of morbidity and mortality are easily curable diseases by these vital medicines. Hence, the success of healthcare sector cannot be realistic without efficient and effective inventory management. However, stock-outs are main causes of health care service interruptions (Santhi and Karthikeyan, 2016).

An additional quantity of stock kept in inventory to protect against unexpected fluctuations in demands and/or supply. If demand is greater than forecast or supply is late, a stock shortage will occur. Safety stock is used to protect against these unpredictable events and prevent disruptions in the hospital (WHO, 2010).

Monitoring and controlling the flow of pharmaceuticals can be challenging, Bansal et al (2008) explained that improper monitoring gives rise to big chances of pilferage and under-utilization of pharmaceuticals. However, physical inventory checks can be time consuming and therefore demands proper planning.

Pharmaceutical inventory management challenges at the macro level includes economic factors, government policy and legal & political factors technological factors socio-cultural factors whereas Pharmaceutical inventory management challenges at micro level includes connectivity, capacity, top management commitment, skill gap, financial and employs challenge (Gupta et al, 2007).

Economic Challenges Shadrack et al (2015) mentioned that the pharmaceutical inventory management need enough budgets so that the organizations need to invest their financial preparedness. Poor investment on inventory results frequent stock out and service interruption.

Technological Challenges

Technological challenges in pharmaceutical inventory management includes lack of integrated systems such as use of ERP system which allows organizations to have better control over pharmaceuticals flow and information flow across the pharmaceutical supply chain. Use of manual inventory management system cannot track the pharmaceutical stocks automatically to prevent sock out and improve availability of pharmaceuticals (Mursyid & Ilma, 2013).

Capacity: In order to maintain required pharmaceuticals, stock the warehouses of the hospital need enough space for the storage of pharmaceuticals (Shadrack et al,2015).

Policy changes: -Kelle, Woosley& Schneider(2012) explained that the actions of national governments like quota restriction and sanctions also affects pharmaceutical procurement. The government may change the procurement policy and purchase processes.

Legislative Challenges: -The legislative challenges concerned with pharmaceutical inventory management includes the regulation and lengthy bureaucratic procedures (Van Heck, 2009).

Socio- cultural influence

Shiau(2017) stated that the reliable workers with a good attitude, with high skills and knowledge, and ethics and train them to become high-level people, which can speed up the success of pharmaceutical inventory management. The availability of the store manager, professional personnel at the pharmacy store, is considered as a significant factor in determining the operational performance of pharmaceutical inventory management (Nurulet al, 2012).

Top level management lack of commitment challenges

Top level management makes an inventory management decision that can affect the lead time of the procurement. In the hospital there is bureaucratic process in procurement. The top-level management affect the inventory control and influence the budgets of pharmaceuticals (Shadrack et al,2015).

Shortage or stock out

Pharmaceuticals shortage or stock out occurs when the required pharmaceuticals are not available at the right place, quantity, time, and quality. Pharmaceuticals shortage or stock out is a challenging in pharmaceutical inventory management since it hinders patient care(Nurul et al, 2012).

Lead time challenges

Lead time is the time between the placement of order and replenishment of products. It causes delays in inventory management and. Lead time is a challenge for organizations since it affects the amount of stock a company needs to hold at a point in time it prevents the organizations to optimize inventory(Kumurya, 2015).

2.2 Empirical Review

The study conducted in Ghana by Nyakeri & Ochiri(2014) the health system indicated that all commodities procured at the National level are stored at the Central Medical Stores (CMS). The study also revealed that the pharmaceuticals inventory is maintained in a number of intermediate facilities and the Tertiary Hospitals, Regional Medical Stores (RMS) and even private sector suppliers then get their supplies from the Central Medical Stores. The hospitals obtain a non-availability certificate when the pharmaceuticals are out of stock which allows them to go ahead and do their purchase outside the CMSs and RMSs and ensure pharmaceuticals availability and prevent the stock out of pharmaceuticals.

Yiggit (2016) indicated that, the study conducted in Turkey, the pharmaceutical inventory control and management in university hospital is very crucial. This study revealed that inventory control needs effective and efficient management of the existing resources because hospital resources are limited. As the study explained, ABC- VEN matrix analysis provides an important management tool for the effective and efficient management of the inventory in hospital. Due to this analysis, inventory costs can be minimized in the university hospital. As the study indicated the management of class I vital pharmaceuticals requires top managerial control and these pharmaceuticals must be constantly keep in stock for uninterrupted health care service. Category 2 and category 3 pharmaceutical need middle and lower managerial control respectively.

The study conducted in Namibia indicated that health facilities are expected to order products from Central Medical Stores and the survey revealed that stock records were not adequately kept and physical inventory counts did not balance with either stock records or computerised records. The study also indicated that the reason for the problems were lack of system which can be used for deciding when, what and how much to order so that most health facilities were placing many emergency orders (MSH, 2008).

The study conducted in Malawi by Pallangyo (2014) indicated that drug availability was poor and stock out of drugs was 95%. The study also indicated that the reasons for the problems were tedious and bureaucratic process of procuring drugs, parallel system to purchase pharmaceuticals for treatment programmes and lost through theft. The identified causes of stock outs in this case are within the stocks control system and they are revealing the weakness of the system.

The study conducted by Obeagu Emmanuel Ifeanyi and Swem Collins Abum (2018) in Nigeria indicated that the challenges of pharmaceuticals inventory management system need coordinated and integrated inventory management system, sustainable human resource and infrastructure development and an effective data management system to address the challenges such as lead time, safety stock, and the review period. The study also revealed that ordering up to the maximum stock level helps to ensure that all products are regularly available.

The study conducted on pharmaceuticals supply chain management in Ethiopia on selected public hospitals indicated that the pharmaceuticals supply management system of Ethiopia has several problems including non-availability, no affordability, poor storage and stock management and irrational use (WHO/AFRO/JSI, 2009).

According to Dessalegn (2015) the study conducted at EPSA, Addis Ababa Ethiopia, pharmaceutical inventory management the result indicated that the inventory data visibility is poor, lack of data management, lack of accountability and lack of integrated inventory information sharing to the concerned bodies. As a result, stock out notifications, procurement and stock on hand, were not complied and shared regularly to FMOH and stakeholders. The data visibility issues at health facility were mostly lack of accountability, poor adherence to schedule, and lack of completeness and quality of reports.

N.Barasa, S Oluchina, & W Cholo (2018) the study conducted at Bungoma County, in Kenya indicated that proper pharmaceutical inventory management practices were important in ensuring continuous availability of medicines, reduces frequent stock outs and possibility of expiry of medicines and thus it has direct effects on the availability of medicines in Bungoma county's public health facilities. Pharmaceutical inventory management challenges relating to inventory management of medicines were also identified. The study also identified that there is a need to have pharmacy professionals that are at the core aspect of pharmaceutical management as they are trained on handling medicines better as compared to other health care workers.

2.3 Literature Gaps

During this study, the researcher reviewed a lot of theoretical and empirical literature which are relevant to the thesis. The study by Ali (2011) was focused on the store management, availability of the storage areas, whereas the study by Santhi and Karthikeyan (2016) was on warehousing management practice and distribution effectiveness. The potential areas that will

affect pharmaceuticals availability such as the inventory management and control of the flow of stock and information, causes of stock out of pharmaceuticals, aspects of pharmaceutical inventory management practices that need to be considered and challenges related to inventory management of pharmaceuticals were not assessed by these revealed empirical researches. The study intends to fill these gaps on the areas which are not researched by other.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1. Introduction

This chapter presents the methodology applied to achieve the objectives of the research, the research approach and design, the research population and sample, the nature and source of data collected and instrument used for the research. In addition, description of the tests employed to establish reliability and validity of the collected data for further analysis and ethical issues are discussed in this chapter.

3.2 Description of the Study Area

The Tikur Anbessa Specialized Hospital (TASH) is the largest specialized hospital in Addis Ababa, Ethiopia. It was established in 1972. It is the teaching hospital of the College of Health Sciences of AAU, with over 1200 beds, and serves as a training center for undergraduate and postgraduate medical students, dentists, pharmacists, nurses, midwives, medical laboratory technologists, radiology technologists, and others who shoulder the health problems of the community and the country at large (Tikur Anbessa Specialized Hospital Directory, 2019).

The different departments under specialty training in the school of medicine faculty members and residents provide patient care in the hospital. Moreover, almost all regional and federal hospitals in Addis Ababa use this hospital as referral unit and training site. The hospital serves more than 500,000 patients per year in its 20 outpatient specialty clinics, inpatient and emergency departments (TASH Directory, 2019).

For all of the services rendered by TASH, the pharmaceuticals, including medical equipment, are supplied through pharmacy service directorate. The pharmaceutical warehouses are structured and managed as medication, medical equipment & laboratory reagents, and supplies warehouse. It provides the demand of each pharmacy unit and other departments in the hospital. It is an institution where specialized clinical services that are not available in other public or private institutions are rendered to the whole nation (TASH Directory, 2019).

3.3 Research Approach

The study used a mixed research approach. Both of qualitative and quantitative data was collected. Qualitative data was gathered through in-depth face to face interviews and

observations and whereas the quantitative data was gathered through self-administered questionnaires.

To address the research problem using a survey method the study used semi structured and self-administered questionnaire were developed based on research questions and objectives by observing the accepted questionnaires of different international and national conducted researches. The reason to implement self-administered closed ended questionnaire is because of its low-cost requirement and not consume much time to be answered by the respondents and quicker to administer by the researcher.

In-depth interview is a qualitative technique designed to draw out a glowing picture of the participant's perspective on the research topic. In depth interview is an effective qualitative method for getting people to talk about their personal feelings, opinions, and experiences.

The rationale for applying both methods is that, using a combination of quantitative and qualitative data can improve an evaluation by ensuring that the limitation of one type of data is balanced by the strengths of another (Pin, 2015).

3.4 Research Design

Research design is the blueprint and structure to plan and execute a particular research. It helps to answer research questions and fulfill research objective. There are three types of research design, namely exploratory (emphasize discovery of ideas and insights), descriptive (deals with determining the frequency with which an event occurs or relationship between variables) and explanatory (concerned with determining the cause and effect relationship) (John, 2007).

This study followed a descriptive research design (the facility based cross-sectional descriptive study design) so as to describe and assess the current pharmaceutical inventory management practices and challenges of TikurAnbessa Specialized Hospital. A descriptive cross-sectional study is a descriptive survey which gathers data at particular point in time with the intentions of describing the nature of existing conditions or assessing specific information (Kombo and Tromp, 2006).

The data was collected by using self-administered questionnaires, interviews and observation (direct visit and comparing the pharmaceutical inventory management of TASH against a standard check list). In the analysis part the researcher used descriptive statistics (mean, standard deviation) was done by SPSS software version 20 and excel.

3.5 Population of the study

The target population should be a set of all individuals relevant to a particular study and need to be defined in terms of elements, geographical boundaries and time (Leedy and Ormrod et.al, 2012). The hospital has 86 pharmacists, 59 laboratory technologists, 48 heads of wards, and 18 heads of OPDs & emergencies; that acquire and manage pharmaceuticals. Hence the study has the total population of 211.

3.6 Sample size of the study

The sample size for the study calculated according to the formula recommended by Yamane's (1967) with 95% confidence and 5% acceptable sampling error.

$$n = \frac{N}{1 + N(e)^2}$$

$$n = \frac{211}{1 + 211(0.05)^2} = 138.13 \approx 138$$

Where, 'n' is sample size, 'N' is target population 'e' is significance level of 0.05

Therefore, the required sample size is 138. By using proportionate stratified sampling based on this sample size, the proportion ($138/211 \approx 0.65$) is assigned to each stratum. Then, each stratum targeted population had a multiple of 0.65 with its population size.

Table 3.1 Sample Size

Target population Type	Population size (N)	Proportion	Sample size (n)
Pharmacists	86	0.65	(86x0.65) =56
Laboratory technologists	59	0.65	(59x0.65) =38
Heads of wards	48	0.65	(48x0.65) =32
Heads of OPDs & Emergencies	18	0.65	(18x0.65) =12
Total	211	138/211≈0.65	138

Source: own compilation from human resource at TikurAnbessa Specialized Hospital (2020)

Selection of respondents for the study was based on non-probability purposive sampling method through which the respondents were selected on the basis of being able to provide an in-depth understanding on the topics being studied.

Moreover, a questionnaire was administered to pharmacy directorate head, warehouse manager, laboratory head, ward coordinators, OPDs heads and emergencies coordinators. A total of 138 questionnaires were administered. To the face to face interviews a total of seven personnel from pharmaceutical supply chain case team leader (1), warehouse manager (1), Laboratory technologists (2), Heads of wards (2), and Head of OPD (1) were selected.

3.7 Data Types, Sources and Collection

3.7.1 Data Types

Both the qualitative and quantitative data was collected.

3.7.2 Data Sources

The study relied on both primary and secondary data. Primary data was collected with the use of semi structured questionnaires, face to face interviews and observation check list and secondary data was obtained from documentation such as Bin cards, stock cards, RRF, IFRR, Good receiving model(model 19), and Good issuing model(model 22). The interviews follow a questionnaire, which was attached in annex. These check list and questionnaire are adopted with some modification from previous works (Anichebe&Agu, 2013).

3.7.3 Data collection instrument

Data was collected from relevant sources using self-administered questionnaires and in-depth face to face interviews. A questionnaire was chosen as the main data collection instrument. A questionnaire is a printed self-report form designed to elicit information that can be obtained through the written responses of the respondents. The information obtained through a questionnaire is similar to that obtained by an interview, but the questions tend to have less depth (Burns and Grove, 1993).

Data will be collected with the aid of questionnaires to evaluate the management and staff knowledge and views the subject matter and pharmaceutical inventory management practices and challenges at TASH. The questionnaire will be designed to meet the objectives of the study. It was adopted from previous works (Oballah et al., 2015 and AnichebeandAgu, 2013) but the researcher designed it to suit the objectives of the study in order to solicit answers that would meet the objectives.

Questionnaires were personally distributed by the researcher and the data was collected over a period of one month and half (March 1 to April 15, 2020). Before the questionnaires were administered, the researcher seeks permission from the hospital and interviewed a few staff.

The researcher interviewed some staff to know the activities of the hospital. From that, the questionnaires were designed for the respondents.

3.7.4 Pre-test of data collection instrument

A pre-test of the questionnaire was done in order to ensure that the objectives were met. The purpose of the pre-test activity is to ensure that the questionnaires are meaningful, easily understood and appropriate for the main fieldwork.

Ten health professionals, among who acquire and manage pharmaceuticals, with high experience, experts and experience of researches /master's degree and PhD holders/were purposively selected and asked for their agreement to comment on the questionnaire. They were also asked to comment on the format and wording of the questionnaire. They were from pharmacists (5), laboratory technologists (3) and ward coordinators (2). The activity enabled the researcher to become more familiar with items of the questionnaires and prepare them accurately for the main work. It also helped to get correction and do the correction and then distribute the questionnaires to respondents.

The health professionals who were included in the pre-test were not involved in responding to the final questionnaire.

3.8 Variables of the Study

3.8.1 Independent Variables

Independent variables include; training, selection, quantification and forecasting, procurement, warehousing, distribution, inventory counting process, stock procedure /record/ABC/VEN analysis and information generation.

3.8.2 Dependent Variables

Dependent variables include; optimum inventory, efficient&effective inventory control and management & utilization of budget, timely delivery, reduced lead time, reduction of waste, greater accuracy of information, availability of pharmaceuticals, uninterrupted supply, operational performance and responsiveness.

3.9 Ethical Consideration

Researcher asked an official letter of co-operation of support from Addis Ababa University School of Commerce. By that letter TASH was asked for permission. The respondents were asked for their informed consent and they were informed that information they give will be kept confidential. To assure confidentiality, anonymous questioners were conducted after

explaining that the respondents' name was unnecessary. More over their participation was willingly and they have the right to refuse participation also have the right to withdraw from the research any at time.

Research participants was informed that they have the right to informed of all aspects of a research task. Knowing what is involved, how long it will take and what will be done with the data, a person can make an intelligent choice to whether to participate in the study. All participants have the right to privacy, the right to safety, the right to be informed, and the right to confidentiality (Kumar and Kandasamy, 2012).

3.10 Data Analysis plan

First of all, to ensure consistency and completeness, the collected quantitative data was checked to detect for any errors manually. After the data was checked it was coded, entered and analyzed by the use of Statistical Package for the Social Sciences (SPSS) version 20 and excel. Study results that were analyzed have presented by using descriptive statistics (mean, standard deviation, frequency distributions and percentage).

The descriptive statistics was used to describe the basic features of the data in the study and help to provide summaries. Qualitative data was analyzed in its thematic areas to describe the pharmaceutical inventory management practices and challenges responded from staffs. The qualitative results discussed in relation to the quantitative results.

3.11 Validity and Reliability

Validity and reliability are very important criteria when doing a research. Validity indicates the degree to which an instrument measures what it is supposed to measure whereas reliability is concerned with accuracy and precision of a measurement procedure. A measuring instrument is reliable if it provides consistent results (Pin, 2015).

3.11.1 Validity of the study

Validity is an instrument to see if the study measures what it is intended to measure. In order to assess the validity of data collection instruments a pilot study will be conducted prior to the actual data collection. Before administering the final phase, a pilot study was conducted to refine the questionnaires, test instrument and identify unclear or vaguely formulated statements. Questionnaires were tested on potential respondents to make the data collecting instruments objective, relevant, suitable to the problem and reliable as recommended by (Adams et al., 2007). Issues raised by respondents during pilot test were gathered and

questionnaires were refined accordingly. To test validity pharmacists (5), laboratory technologists (3) and ward coordinators (2). The ten health professionals were given twenty minutes to complete the questionnaire and the researcher was available to assist. Respondents were also asked to comment on the format and wording of the questionnaire. In addition to this the questionnaire was adapted from different questionnaire of others researchers.

3.11.2 Reliability

Reliability refers to the degree to which the instrument was given the same results if a survey is repeated on the same sample. Parasuraman, Grewal& Krishnan et.al (2007: 133). To ensure reliability of this study, a Cronbach’s Alpha was performed as a measure to see if the study repeats the same results if the same experiment will be performed again. In this study, a reliability test was performed in order to see whether the study will give similar results if the same study will be repeated.

After the pre-test the reliability of the instruments and data was established. Cronbach’s Alpha was be used to test reliability of the study. In the table below the Cronbach’s alpha values of the structures of the questionnaire were listed.

Table 3.2Cronbach’s Alpha test result from SPSS

	Reliability Statistics	
	Cronbach's Alpha	N of items
Inventory management and control	0.799	17
The reasons of the stock out of pharmaceuticals	0.808	9
Aspects of pharmaceutical inventory management practices that need to be considered	0.815	8
Challenges of pharmaceutical inventory management	0.719	11
Total N		45

According to the data collected from 112 respondents the overall Cronbach’s alpha score was above 0.7. Cronbach, (1951) suggested that a value of Cronbach’s alpha above 0.70 to be an acceptable reliability coefficient, since each score as shown on the above table was greater than the standard threshold level, the questionnaire was reliable.

CHAPTER FOUR

RESULTS, DISCUSSIONS AND INTERPRETATIONS

4.1 Introduction

This chapter presents the analysis of data followed by a discussion of the research findings. The findings are related to the research questions which guides the study. Data were analyzed to identify and describe the practices of pharmaceutical inventory management of Tikur Anbesa Specialized Hospital, to identify the aspects of pharmaceutical inventory management practices that need to be considered in TASH as well as to explain the reasons of stock out of pharmaceuticals at Tikur Anbesa Specialized Hospital. In addition, the main challenges related to inventory management of pharmaceuticals at TASH are identified and described.

The primary data were obtained from Tikur Anbesa Specialized Hospital employees mostly involved in acquiring and managing the pharmaceuticals which included pharmacists, laboratory technologists, heads of wards, and heads of OPDs and emergencies. Secondary data were obtained from documentation such as Bin cards, stock cards, RRF, IFRR, Good receiving model (model 19), and Good issuing model (model 22).

To make the data collected via questionnaire complete, seven participants from different departments; senior pharmacists (2), senior laboratory technologists (2), heads of wards (2) and head of OPD (1) were interviewed.

4.1.1 Descriptive Statistics

Descriptive statistics summarize the group of data using a combination of tabulated description (i.e., tables), graphical description (i.e., graphs and charts) and statistical commentary (i.e., a discussion of the results). Two general types of statistic; measures of central tendency (mode, median, and mean) and measures of spread (range, quartiles, variance and standard deviation). In this study mean from measure of central tendency and standard deviation from measures of spread were used. Standard deviation tells us about the shape of the distribution, how close the individual data values are from the mean value. When used together, standard deviation and mean, they help to provide a more complete picture.

In this study the data collected through self-administered questionnaire was analysed by descriptive statistics. Furthermore, the data from observation based on check list and face to face interview were used to triangulate the entire study.

4.2 Response Rate

Based on the sample selected, 138 questionnaires were distributed and 119 questionnaires were returned of which 112 were valid and met the required criteria. This represented 81.15% of response rate. The response rate of 50% is adequate for analysis and reporting; a rate of 60% is good and a response rate of 70% and over is excellent (Mugenda and Mugenda, 1999). Accordingly, the response rate was considered to be excellent.

Table 4.1 Response Rate

Profession/Position of work of the respondents	Questionnaires distributed	Questionnaires returned	Valid	Valid %
Pharmacists	56	51	48	85.71%
Laboratory technologists	38	31	29	76.31%
Heads of wards	32	28	27	84.37%
Heads of OPDs and emergencies	12	9	8	66.66%
Total	138	119	112	81.15%

Source: own survey 2020

4.3 Demographic Profile of Study Participants

In this section brief personal and general information of the sample at TASH is presented. The demographic characteristics from the survey were used to review the characteristics of respondents. Age range (in years), sex, profession type, type of department in which the respondent is working, years of work experience, educational qualification and current work position of respondents were indicators. Assessing respondents' age, sex, helps to determine whether the study considered heterogeneity of sample units. In addition, when the respondents are more experienced and educated, they have better opportunity to understand the case and give better response than else and that is why assessing the work experience and education level of the respondents is needed.

Sex

Demographic Characteristics The results as shown in the table 1 below, females (43.75%) & males (56.25%) majority of the respondents were males at (56.25%) % while female were

(43.75%). This indicates that majority of the staffs working in the selected departments for the study were males.

Age in years

The respondents were asked to show their age in years, 9 (8.03%) were between ages 18-25 years, 74 (66.07%) were between 26-35 years of age, 21 (18.75%) were between 36-45 years of age, 8 (7.14%) were between 46-55 years of age & 2 (1.78%) were above the ages of 55 years. Most of the respondents (66.07%) were between the ages of 26-35 years.

Educational level

The respondents were asked to show their education level. The results as shown in the table 4.2 educational background of the respondents 2 (1.78.9%) were PhD degree holders; 21 (18.75%) were Master's degreeholders; 89 (79.46%) were Bachelor's Degree holders and no any respondent is at diploma level (0%). This could indicate that majority of those working in the organization had attained education up to university level and had gained rich information and they were conversant with the process; therefore, they were appropriate for responding to our study questions.

Work experience

The respondents were asked to show their work experience 3(2.67%) of respondents had less than one year's work of experience, 21 (18.75%) between 1-3 years; 69 (61.60%) between 4-6 years, 8 (7.14%) between 7-9 years and 11 (9.82%) were greater than 10 years of experiences. The respondents were appropriate for responding to the study questions since the majority of those working in the organization had experienced and gained rich information.

Profession

The respondents were asked to show their professions 48 (42.85%) were pharmacy professional's, 29 (25.89%) were laboratory professional's; 26 (23.21%) were nurses; 7(6.25%) were sub specialists and 2 (1.78%) were specialists. The respondents were appropriate for responding to the study questions since they were from different departments who are involved in acquiring and managing of the pharmaceuticals.

Table 4.2 Demographic Profile of Study Participants

S/N	Indicators	Indicators	Frequency	Percent
1	Age	18-25 Years	9	8.03%
		26-35 Years	74	66.07%
		36-45 Years	21	18.75%
		46-55 Years	8	7.14%
		>55 Years	2	1.78%
Total			112	100%
2	Sex	Male	63	56.25%
		Female	49	43.75%
Total			112	100%
3	Educational Level	Diploma	0	0%
		Bachelor's Degree	89	79.46%
		Master's Degree	21	18.75%
		PhD and Above	2	1.78%
Total			112	100%
4	Profession	Pharmacist	48	42.85%
		Laboratory technologist	29	25.89%
		Nurse	26	23.21%
		Sub specialist	7	6.25%
		Specialist	2	1.78%
Total			112	100%
5	Years of work experience	Less than 1 year	3	2.67%
		1 – 3 years	21	18.75%
		4 – 6 years	76	67.85%
		7 – 9 years	8	7.14%
		10 years and above	4	3.57%
Total			112	100%

Source: own survey (2020)

Current work position of respondents

The respondents were asked to indicate their work position 48(42.85%) of them were team coordinator of wards, pharmacy, OPD, and laboratory .In addition, 8.03% of them were drug supply chain team members &3(2.67%) of them were drug supply chain team leader (1), pharmacy directorate head(1),and laboratory head (1)& 2(1.78%) of them were warehouse manager. Totally (42.85%+8.03%+2.67%+1.78%=55.33%) majority of the respondents were responsible personnel in acquiring and managing pharmaceuticals. This implies that the data was taken from the right personnel that able to answer the raised question.

Table 4.3 Work position of respondents

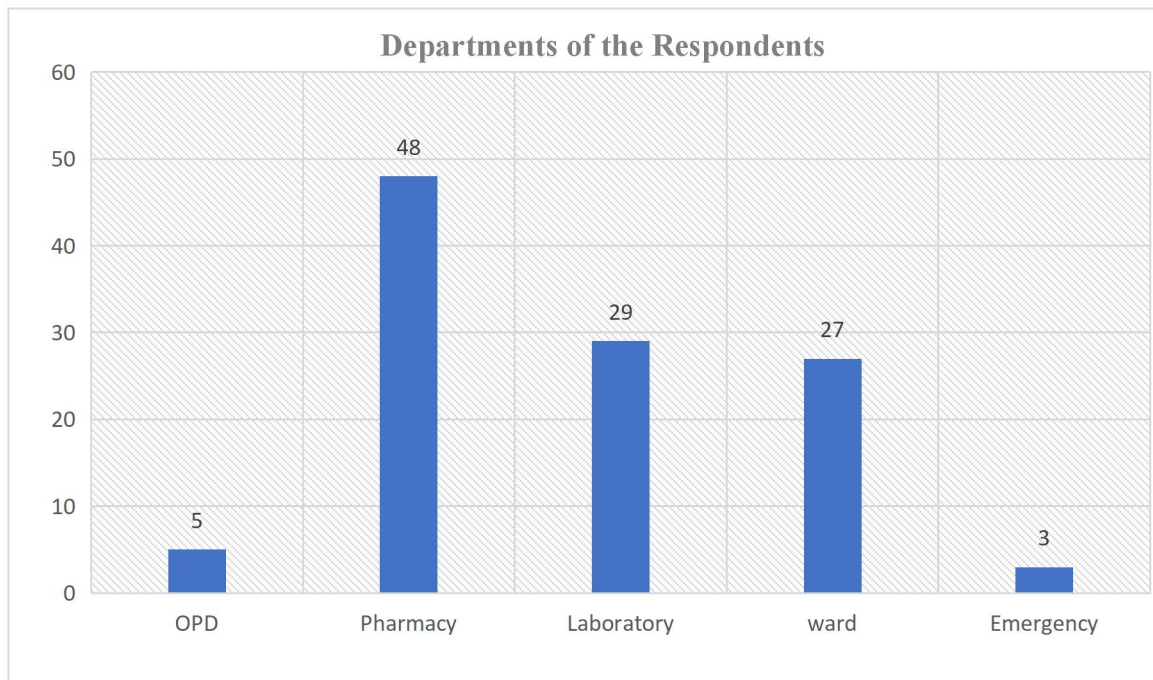
S. N	Current position of work of the respondents	Frequency	Percentage (%)
1	Pharmacy Directorate Head	1	0.89%
2	Laboratory head	1	0.89%
3	Drug supply chain team leader	1	0.89%
4	Drug supply chain team members	9	8.03%
5	Warehouse manager	2	1.78%
6	Team coordinator (e.g. wards,pharmacy,OPD,laboratory)	48	42.85%
7	Others (e.g. pharmacy service, laboratory service)	50	44.64%
	Total	112	100%

Source: own survey (2020)

Department

As shown on the figure below the department of the respondents 5 (4.46%) were OPD, 48(42.85%) were pharmacy, 29 (25.89%) were laboratory, 27(24.10%) were ward and 3(2.67%) were emergency. This indicated that all responsible staffs of the hospital that have involved in acquiring and managing of pharmaceuticals were included in the study.

Figure 4.1 Departments of the respondents



Source; own survey (2020)

4.4 Result and Discussion of pharmaceutical inventory management practices and challenges at TASH

In this section of the study's report, analysis conducted on data gathered to assess the inventory management practices & challenges at TASH is presented in relation to the research question and objectives of the study. Descriptive statistics was used to analyze the data in this study.

Concerned respondents' perceptions were captured along 45 items corresponding to the five dimensions using five-point Likert scale that were introduced to measure the study constructs. Respondents rated their extent of perception from strongly disagree to strongly agree. 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree

The result of the study in inventory management practices and challenges showed that the scores of strongly disagree have been taken to represent a variable which had a mean score of 0 to 1.5, the scores of disagree have been taken to represent a variable with a mean score of 1.5 to 2.5, the score of neutral have been taken to represent a variable which had a mean score of 2.5 to 3.5, the score of agree have been taken to represent a variable which had a

mean score of 3.5 to 4.5 and the score of strongly agree have been taken to represent a variable which had a mean score of above 4.5. The findings of the study are presented below.

4.4.1 Descriptive statistics of the pharmaceuticals inventory management and control practices at TASH

Descriptive statistics of the pharmaceuticals inventory management and control practices at TASH would provide the answer to the research question number one which asked how does Tikur Anbesa Specialized Hospital manage and control the flow of stock and information of pharmaceuticals.

Table 4.4 Respondents' perception on how does Tikur Anbesa Specialized Hospital manage and control the flow of stock and information of pharmaceuticals

	Inventory management and control	Strongly disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly agree (%)	Mean	Standard deviation
1.1	The hospital maintains Maximum, Minimum, and Re-order levels for pharmaceuticals	13(11.6%)	9(8%)	27(24.1%)	63(56.3%)	0(0%)	3.250	1.187
1.2	There is list of essential pharmaceuticals	25(22.3%)	27(24%)	12(10.7%)	46(41.1%)	16(14%)	3.259	0.848
1.3	Inventory procedures give appropriate consideration to the location and arrangement of inventories	3(2.7%)	39(34.8%)	11(9.8%)	57(51%)	2(1.8%)	3.143	1.079
1.4	The hospital uses Health commodity management information system (HCMIS)	0(0%)	17(15.2%)	18(16.1%)	71(63%)	6(5.4%)	3.589	1.281
1.5	Adequate and detailed written inventory instructions and procedures exist	7(6.3%)	59(52.7%)	31(27.7%)	15(13%)	0(0%)	2.482	0.713
1.6	Auditable pharmaceuticals transaction and services/APTS/ system of this hospital is automated	29(25.9%)	73(65.2%)	8(7.1%)	2(1.8%)	0(0%)	1.848	0.782
1.7	Physical count of inventory is at regular basis	3(2.7%)	8(7.1%)	28(25%)	47(42%)	26(23.2%)	3.759	0.943
1.8	Management carry out review the reconciliation of physical inventory counts to the inventory records	6(5.4%)	47(42%)	18(16.1%)	41(37%)	0(0%)	2.839	0.857
1.9	The hospital established procedures for placing emergency orders	0(0%)	7(6.3%)	12(10.7%)	69(62%)	24(21.4%)	3.821	0.993
1.10	The hospital uses periodical replenishment of stocks	7(6.3%)	24(21.4%)	18(16.1%)	56(50%)	7(6.3%)	3.286	1.018

1.11	Each dispensing unit fills properly and periodically the Internal Facility Report and Re- supply Form/ IFRR/ to request and receive pharmaceuticals from the warehouse	11(9.8%)	17(15.2%)	12(10.7%)	59(53%)	13(11.6%)	3.411	1.065
1.12	The hospital uses ABC/VEN (Vital, Essential & Non-essential) analysis to classify items according to their stock value	3(2.7%)	27(24%)	14(12.5%)	68(60.7%)	0(0%)	3.313	0.801
1.13	Use of ABC/VEN (Vital, Essential & Non-essential) analysis leads to efficient management of resources	5(4.5%)	5(4.5%)	15(13.4%)	74(66%)	13(11.6%)	3.759	1.330
1.14	Obsolete, expired or damaged inventories properly identified and segregated	6(5.5%)	18(16.1%)	11(9.8%)	55(49%)	22(19.6%)	3.616	1.025
1.15	Disposal of waste and expire of pharmaceuticals is according to the Disposal Guideline	8(7.1%)	15(13.4%)	7(6.3%)	48(43%)	34(30.4%)	3.759	1.045
1.16	Requisition & Re- supply Form /RRF/ is reported periodically	25(22.3%)	21(18.8%)	7(6.3%)	46(41%)	13(11.6%)	3.009	0.852
1.17	Consumption data is available for each pharmaceutical	11(9.8%)	47(42%)	19(17%)	32(28.6%)	3(2.7%)	2.723	0.701
Mean of mean and Average standard deviation							3.275	0.971

Source: own survey, 2020

Table 4.2 shows the descriptive statistics of pharmaceuticals inventory management and control practices of TASH based on arithmetic mean and standard deviation. According to the respondents, the hospital maintains Maximum, Minimum, and Re-order levels for pharmaceuticals, there is list of essential pharmaceuticals, inventory procedures give appropriate consideration to the location and arrangement of inventories, the hospital uses Health commodity management information system (HCMIS), adequate and detailed written inventory instructions and procedures exist, auditable pharmaceuticals transaction and services/APTS/ system of this hospital is automated, physical count of inventory is at regular basis, management carry out review the reconciliation of physical inventory counts to the inventory records, the hospital established procedures for placing emergency orders, the hospital uses periodical replenishment of stocks, each dispensing unit fills properly and periodically the Internal Facility Report and Re- supply Form/ IFRR/ to request and receive pharmaceuticals from the warehouse, use of ABC/VEN (Vital, Essential & Non-essential) analysis leads to efficient management of resource, Obsolete, expired or damaged inventories

properly identified and segregated, disposal of waste and expire of pharmaceuticals is according to the Disposal Guideline, Requisition & Re- supply Form /RRF/ is reported periodically, consumption data is available for each pharmaceutical, the mean score of the participants were 3.250, 3.259, 3.143, 3.589, 2.482, 1.848, 3.759, 2.839, 3.821, 3.286, 3.411, 3.313, 3.759, 3.616, 3.759, 3.009 and 2.723 respectively.

The values of the standard deviation show the spread of ideas of the respondents so that the standard deviation ranges from 0.701 to 1.330 indicating that it is a small value therefore, respondents were agreeing to the same idea.

The mean values of each of the items of inventory management and control indicator were calculated between 1.848 and 3.821 with standard deviations that range between 0.701 and 1.330. The lowest mean value is registered in the case of Auditable pharmaceuticals transaction and services/APTS/ system of this hospital is automated followed by the mean score for Adequate and detailed written inventory instructions and procedures exist and hospital uses ABC/VEN (Vital, Essential & Non-essential) analysis to classify items according to their stock value, Consumption data is available for each pharmaceutical and Management carry out review the reconciliation of physical inventory counts to the inventory records respectively. The highest mean value is registered in the case of hospital established procedures for placing emergency orders followed by physical count of inventory is at regular basis, Use of ABC/VEN (Vital, Essential & Non-essential) analysis leads to efficient management of resources, disposal of waste and expire of pharmaceuticals is according to the Disposal Guideline and Obsolete, expired or damaged inventories properly identified and segregated respectively.

According to the respondents, concerning the hospital maintains Maximum, Minimum, and Re-order levels for pharmaceuticals, 56.3% of them agreed whereas 24.1% of them replied neutral and 11.6% strongly disagree. The mean of 3.250 and standard deviation of 1.187 were calculated. Open ended questions and observation of the bin card data confirmed that the pharmaceutical inventory management of the hospital maintains Maximum, Minimum, and Re-order levels for pharmaceuticals for pharmaceuticals.

The average mean of the study result concerning the pharmaceutical inventory management and control of the flow of stock and information of pharmaceuticals inventory management practices at the Tikur Anbesa Specialized Hospital is 3.275. This indicated that respondents are rating the hospital practice performance as moderate.

From the respondent asked to quantify their level of perception about the availability of adequate and detailed written inventory instructions and procedures exist, 6.3% % of the respondents strongly disagree, 52.7%disagree,27.7% neutral while13%felt agree and with the mean value2.482. The result showed that adequate and detailed written inventory instructions and procedures not availability at TASH.

In addition, respondent's perception on the question that, physical count of inventory is at regular basis, 7.1 % disagree, 2.7 % strongly disagree, 25% neutral, 42% agree while 23.2%strongly agree with mean value of 3.759 and standard deviation of 0.943. The results revealed that majority of the respondents agreed on the indicator that physical count of inventory is at regular basis.

As displayed in the table 4.4, 50% agreed and 6.3% strongly agreed of respondents replied that the hospital uses periodical replenishment of stocks while 16.1% felt neutral, 21.4% disagreed and 6.3%strongly disagreed with standard deviation of 1.018which indicated that the hospital practiced periodical replenishment of stocks. Open ended question also confirmed that the hospital replenishes the stocks periodically.

Regarding to the indicator that the hospital uses ABC/VEN (Vital, Essential &Non-essential) analysis to classify items according to their stock value, 68(60.7%) of respondents agreed that the hospital is practising the ABC/VEN (Vital, Essential &Non-essential) analysis to classify items according to their stock value. 27(24%) respondents disagreed on this indicator that the hospital uses ABC/VEN (Vital, Essential &Non-essential) analysis to classify items according to their stock value. Opinions obtained from open ended questions during the interview also confirmed that the hospital uses the ABC/VEN (Vital, Essential &Non-essential) analysis to classify items according to their stock value.

Furthermore, respondent's perception on the question that, the hospital uses Health commodity management information system (HCMIS) 17(15.2%) said disagree, 18(16.1%) replied neutral, 71(63%) agree, while 6(5.4%) of respondents strongly agree with mean value3.589 and standard deviation 1.281. The result showed that majority of the respondents agreed on the indicator that the pharmaceutical inventory management of TASH is practising the application of Health commodity management information system (HCMIS). The data obtained from observation also confirmed that pharmaceuticals inventory management of this facility uses HCMIS. In addition, almost all of the interviewee confirmed that the hospital is practicing the automated method supported by HCMIS.

Generally, based on the data obtained from the respondents' perception the average mean and standard deviation of the total indicators of inventory management and control represents 3.275 and 0.971 respectively, which indicated that inventory management and control of the pharmaceuticals is practiced at the moderate level since the quantitative result showed 3.275 which indicate the neutral level practices of the indicators of the inventory management and control at TASH. Small value of average standard deviation, which is 0.971, shows that respondents were agreeing to the same idea.

4.4.2 Descriptive statistics of the causes of the stock out of pharmaceuticals of TASH

Descriptive statistics of the causes of the stock out of pharmaceuticals of TASH would provide the answer to the research question number two which asked causes of the stock out of pharmaceuticals at the TASH.

Table 4.5 Respondents' perception on the reasons of stock out of pharmaceuticals at the TASH

	The reasons of the stock out of pharmaceuticals	Strongly disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly agree (%)	Mean	Standard deviation
2.1	Stock out of pharmaceuticals occurs because of pharmaceuticals' selection problem	16(14.3%)	29(25.9%)	9(8%)	51(45.5%)	7(6.3%)	3.036	1.104
2.2	Stock out of pharmaceuticals occurs because of pharmaceuticals' quantification problem	7(6.3%)	17(15.2%)	19(17%)	53(47.3%)	16(14.3%)	3.482	0.961
2.3	Stock out of pharmaceuticals occurs because of pharmaceuticals' forecasting problem	9(8%)	14(12.5%)	21(18.8%)	50(44.6%)	18(16.1%)	3.482	0.920
2.4	Stock out of pharmaceuticals occurs because of procurement problem	12(10.7%)	21(18.8%)	17(15.2%)	49(43.8%)	13(11.6%)	3.268	0.887
2.5	Stock out of pharmaceuticals occurs because of direct procurement from only EPSA/Pharmaceuticals Fund and Supply Agency/	11(9.8%)	17(15.2%)	11(9.8%)	57(50.9%)	16(14.3%)	3.446	1.035
2.6	Stock out of pharmaceuticals occurs because the EPSA unable to fulfill the demand of the TASH.	3(2.7%)	13(12.0%)	24(21.4%)	61(54.5%)	11(9.8%)	3.571	0.943
2.7	Stock out of pharmaceuticals occurs because the EPSA unable to realize sustainable supply of pharmaceuticals to the TASH	19(17%)	20(17.9%)	4(3.6%)	49(43.8%)	20(17.9%)	3.277	0.936
2.8	Stock out of pharmaceuticals occurs because the hospital allocates insufficient	10(8.9%)	31(27.7%)	18(16.1%)	37(33%)	16(14.3%)	3.161	0.699

	budget							
2.9	Stock out of pharmaceuticals occurs due to lack of trained man power on pharmaceutical inventory management	21(18.8%)	38(33.9%)	41(36.6%)	9(8%)	3(2.7%)	2.420	0.654
Mean of mean and Average standard deviation							3.283	0.904

Source: own survey (2020)

The mean values of each of the indicator for the reasons of stock out of pharmaceuticals were calculated between 2.420 and 3.571 with comparable standard deviations that range between 0.654 and 1.104. The lowest mean value is registered for the reasons of stock out of pharmaceuticals occurs due to lack of trained man power on pharmaceutical inventory management followed by stock out of pharmaceuticals occurs because the EPSA unable to fullfill the demand of the TASH, stock out of pharmaceuticals occurs because the hospital allocates insufficient budget, stock out of pharmaceuticals occurs because of procurement problem, stock out of pharmaceuticals occurs because of pharmaceuticals' quantification problem which are 2.420,3.036,3.161,3.268 and 3.482 respectively. The highest mean value is registered in case of stock out of pharmaceuticals occurs because the EPSA unable to fullfill the demand of the TASH which is 3.571.

Concerning the indicator that the stock out of pharmaceuticals occurs because of pharmaceuticals' selection problem according to the respondents' perception 4.5% strongly disagreed, 9.8% of them disagreed and 21.4% of them replied neutral whereas 54.5% of them agreed and 9.8% of them strongly agreed which indicated that majority of the respondents 54.5% agreed that stock out of pharmaceuticals occurs because of pharmaceuticals' selection problem. This was supported by one of key informant that "The stock out of pharmaceuticals mainly occurs due to procurement problems".

In addition, more than half, that is 54.5% of the respondents agree, while 21.4% felt as neutral with mean value 3.554 on that stock out of pharmaceuticals occurs because the EPSA unable to fullfill the demand of the TASH. The result showed that the stock out of pharmaceuticals occurs because the EPSA unable to fullfill the demand of the TASH.

From the respondents' perception on the indicator that there is ABC/VEN analysis reconciliation 10.7% strongly disagreed, 23.2% of them disagreed and 17.9% of them replied neutral whereas 46.4% of them agreed and 1.8% of them strongly agreed which revealed that

there is ABC/VEN analysis reconciliation. The highest mean value is registered in the case of there is ABC/VEN analysis reconciliation.

In addition, according to the respondents, concerning the hospital allocates sufficient budget for the procurement 23.2% of them disagreed whereas 11.6% of them replied neutral and 22.3% strongly disagreed and only 10.7% of them agreed which indicated that the inventory management of the hospital is not supported with technology or automation and it is functioning through manual systems.

Regarding the level of perception of respondents on the stock out of pharmaceuticals occurs because of direct procurement from only EPSA/Pharmaceuticals Fund and Supply Agency/, 14.3% of the respondents strongly agree, 50.9% rated as agree, 9.8% said neutral, while 15.2% respondents said disagree and 9.8% rated as strongly disagree with mean score value of 3.446. The result indicated that the majority of the respondents agreed on the indicator stock out of pharmaceuticals occur because of direct procurement from only EPSA/Pharmaceuticals Fund and Supply Agency/. The data obtained from the interview confirmed that direct procurement from only EPSA caused stock out of pharmaceuticals.

Furthermore, regarding to the indicator that the stock out of pharmaceuticals occurs because the EPSA unable to fulfill the demand of the TASH, 61 (54.5%) of respondents agreed and 11 (9.8%) strongly agreed that the stock out of pharmaceuticals occurs because the EPSA unable to fulfill the demand of the TASH. 24 (21.4%) of the respondents felt neutral, 13 (12.0%) disagreed and 3 (2.7%) strongly disagreed on this indicator since the majority of the respondents rated the agreed, it indicated that the stock out of pharmaceuticals occurs because the EPSA unable to fulfill the demand of the TASH. In addition, the data obtained from the interview confirmed that the pharmaceutical demand of the TASH is not fulfilled by the EPSA thus caused stock out at the TASH.

Generally the descriptive statistics for the stock out of pharmaceuticals at the TASH revealed that the average mean of the indicators is 3.236 which indicated that the reasons of stock out of pharmaceuticals was at the neutral level and the average standard deviation, which is 0.904 revealed that it is a small value thus respondents were agreeing to the same idea.

4.4.3 Descriptive statistics of the aspects of pharmaceutical inventory management practices that need to be considered at TASH

Descriptive statistics of the aspects of pharmaceutical inventory management practices that need to be considered at TASH would provide the answer to the research question number three which asked the aspects of pharmaceutical inventory management practices that need to be considered in TASH.

Table 4.6 Respondents' perception on the aspects of pharmaceutical inventory management practices that need to be considered at TASH

S. N	Aspects of pharmaceutical inventory management practices that need to be considered	Strongly disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly agree (%)	Mean	Standard deviation
3.1	The pharmaceutical inventory management of this hospital is automated	25(22.3%)	62(55.4%)	13(11.6%)	12(10.7%)	0(0%)	2.670	0.625
3.2	Periodical replenishment of stocks is based on consumption data	19(17%)	18(16.1%)	21(18.8%)	51(45.5%)	3(2.7%)	3.009	0.580
3.3	The hospital is implementing the effective and efficient selection, quantification, forecasting and procurement of pharmaceuticals	17(15.2%)	47(42%)	16(14%)	32(28.6%)	0(0%)	2.563	0.725
3.4	On Job training is given to the professionals that directly involved in pharmaceutical inventory management	17(15.2%)	39(34.8%)	41(36.6%)	13(11.6%)	2(1.8%)	2.500	0.665
3.5	There is reduction of waste and expire of pharmaceuticals	11(9.8%)	31(28%)	27(24.1%)	39(34.8%)	4(3.6%)	2.940	0.732
3.6	Integrated information sharing system is designed	27(24.1%)	70(62.5)	9(8%)	3(2.7%)	3(2.7%)	1.973	0.707
3.7	The hospital allocates sufficient budget for the procurement	26(23.2%)	41(36.6%)	14(12.5%)	31(27.7%)	0(0%)	2.446	0.686
3.8	There is ABC/VEN analysis reconciliation	12(10.7%)	26(23.2%)	20(17.9%)	52(46.4%)	2(1.8%)	3.054	0.976
Mean of mean and Average standard deviation							2.644	0.712

Source: own survey, 2020

The finding result showed that the mean values of each of the measurement items of the aspects of pharmaceutical inventory management practices that need to be considered in TASH indicator were calculated between 1.973 and 3.054 with standard deviations that range between 0.580 and 0.976. The lowest mean value is registered in the case of Integrated information sharing system is designed followed by periodical replenishment of stocks is based on consumption data and the hospital allocates sufficient budget for the procurement. Moreover, on job training is given to the professionals that directly involved in

pharmaceutical inventory management and the hospital is implementing the effective and efficient selection, quantification, forecasting and procurement of pharmaceuticals and the pharmaceutical inventory management of this hospital is automated have scored comparably close mean values of 2.500, 2.563 and 2.670 respectively. The highest mean value is registered in the case of there is ABC/VEN analysis reconciliation.

According to the respondents, concerning the indicator that pharmaceutical inventory management of this hospital is automated 55.4% of them disagreed whereas 11.6% of them replied neutral and 22.3% strongly disagreed and only 10.7% of them agreed which indicated that the inventory management of the hospital is not supported with technology or automation and it is functioning through manual systems.

In addition, concerning the indicator that the periodical replenishment of stocks is based on consumption data according to the respondents' perception 17% strongly disagreed, 16.1% of them disagreed and (18.8%) of them replied neutral whereas 45.5% of them agreed and 2.7% of them strongly agreed which revealed that the periodical replenishment of stocks is based on consumption. From the interview this is strengthened by one key informant that "The pharmaceuticals selection, quantification, forecasting and procurement thus the replenishment of pharmaceuticals stocks is based on the consumption data of the hospital". The secondary source of data obtained from bin card, RRF and IFRR were also used as source of consumption data for pharmaceuticals.

According to the respondents, concerning the hospital allocates sufficient budget for the procurement 23.2% of them disagreed whereas 11.6% of them replied neutral and 22.3% strongly disagreed and only 10.7% of them agreed which indicated that the inventory management of the hospital is not supported with technology or automation and it is functioning through manual systems.

Furthermore, according to the respondents, concerning the indicator that the hospital allocates sufficient budget for the procurement according to the respondents' perception 23.2% strongly disagreed, 36.6% of them disagreed and 12.5% of them replied neutral whereas 27.7% of them agreed which indicated that the hospital didn't allocate sufficient budget for the procurement as well as from the interview this is strengthened by three interviewees that the hospital didn't allocate sufficient budget for the procurement.

From the respondents' perception on there is ABC/VEN analysis reconciliation 10.7% strongly disagreed, 23.2% of them disagreed and 17.9% of them replied neutral whereas

46.4% of them agreed and 1.8% of them strongly agreed which revealed that there is ABC/VEN analysis reconciliation. The highest mean value is registered in the case of there is ABC/VEN analysis reconciliation.

Generally the descriptive Statistics for the aspects of pharmaceutical inventory management practices that need to be considered in TASH revealed that the average mean of the indicators was 2.644 which indicated that aspects of pharmaceutical inventory management is practiced below the needed performance and the average standard deviation, which is 0.712, indicated that it is a small value thus respondents were agreeing to the same idea.

4.4.4 Descriptive statistics of the challenges of pharmaceutical inventory management at TASH

Descriptive statistics of the challenges of pharmaceutical inventory management at TASH would provide the answer to the research question number four which asked the challenges of pharmaceutical inventory management at TASH.

Table 4.7 shows that the descriptive statistics of pharmaceutical inventory management challenges at TASH based on mean and standard deviation. The average mean and standard deviation of the total item of challenges of inventory management represents 3.485 and 0.958 respectively, this indicates that most of the respondents show their level of agreement on challenges of inventory management at TASH to be agrees and standard deviation indicating that it is a small value thus respondents were agreeing to the same idea. The standard deviation shows the spread of ideas of the respondents and from the table the standard deviation ranges from 0.250 to 1.278 indicating that it is a small value thus respondents were agreeing to the same idea.

Concerning the indicator that the delays in delivery of pharmaceuticals leads to insufficient inventories according to the respondents' perception 1.8 %strongly disagreed, 9.8% of them disagreed and 10.7 %of them replied neutral whereas 53.6 %of them agreed and 24.1%of them strongly agreed which indicated that majority of the respondents 53.6% agreed that delays in delivery of pharmaceuticals leads to insufficient inventories. This was supported by one of key informant that "long lead time is one the factors that affect the stock out of pharmaceuticals since long lead time delays the delivery of requested pharmaceuticals affects patient care".

Table 4.7 Respondents' perception on the challenges of pharmaceutical inventory management at TASH

	Challenges of pharmaceutical inventory management	Strongly disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly agree (%)	Mean	Standard deviation
4.1	Delays in delivery of pharmaceuticals leads to insufficient inventories	2(1.8%)	11(9.8%)	12(10.7%)	60(53.6%)	27(24.1%)	3.884	1.140
4.2	The hospital is using manual inventory management system/ there is lack of technology	0(0%)	15(13.4%)	6(5.4%)	62(55.4%)	29(25.9%)	3.938	1.196
4.3	In this hospital there is Bureaucratic process in procurement	5(4.5%)	9(8%)	18(16.1%)	71(63.4%)	9(8%)	3.625	1.278
4.4	The warehouses of the hospital have no enough space for the storage of pharmaceuticals	11(9.8%)	22(19.6%)	25(22.3%)	43(38.4%)	11(9.8%)	3.188	0.793
4.5	There is lack of commitment at hospital management level to solve the problems of the management of pharmaceutical inventory	8(7.1%)	12(10.7%)	14(12.5%)	59(52.7%)	19(17%)	3.616	1.077
4.6	The budget for the procurement is insufficient	4(3.6%)	41(36.6%)	6(5.4%)	61(54.5%)	0(0%)	3.107	1.169
4.7	Overstock of pharmaceuticals is common	0(0%)	15(13.4%)	12(10.7%)	53(47.3%)	32(28.6%)	3.911	1.078
4.8	There is frequent expire of pharmaceuticals	3(2.7%)	21(18.8%)	17(15.2%)	47(42%)	24(21.4%)	3.607	0.904
4.9	There is lack of proper training of inventory management	14(12.5%)	23(20.5%)	11(9.8%)	51(45.5%)	13(11.6%)	3.232	0.928
4.10	The stock out of essential medicine is a regular situation	10(8.9%)	29(25.9%)	25(22.3%)	39(34.8%)	9(8%)	3.071	0.735
4.11	Long time it takes your unit to receive pharmaceuticals once a request has been placed	9(8%)	23(20.5%)	28(25%)	45(40.2%)	7(6.3%)	3.161	0.250
Mean of mean and Average standard deviation							3.485	0.958

Source: own survey, 2020

In response to the suggestion to quantify their perception regarding the hospital is using manual inventory management system/ there is lack of technology, 13.4% of respondents disagree, 55.4 agree, 25.9% strongly agree whereas 5.4 % felt as neutral and the mean score value of 3.938.

The mean values of each of the indicator for challenges of pharmaceutical inventory management at TASH were calculated between 3.071 and 3.938 with comparable standard deviations that range between 0.250 and 1.278. The lowest mean value is registered for the stock out of essential medicine is a regular situation followed by the budget for the procurement is insufficient, long time it takes your unit to receive pharmaceuticals once a request has been placed, the warehouses of the hospital have no enough space for the storage of pharmaceuticals, there is lack of proper training of inventory management which are 3.071,

3.107, 3.161, 3.188 and 3.232 respectively. The highest mean value is registered in case of the hospital is using manual inventory management system/ there is lack of technology which is 3.938.

The study observed the challenges of pharmaceutical inventory management of TASH by using observation through the standard check list that the findings were lack of automated stock tracking, lack of written guideline for pharmaceuticals inventory, and lack of sufficient budget for purchase of the pharmaceuticals.

Respondent's perception on the question that, there is lack of commitment at hospital management level to solve the problems of the management of pharmaceutical inventory 8(7.1%) replied strongly disagree, 12(10.7%) disagree, 14(12.5%) replied neutral and 59(52.7%) agree and while 19(17%) of respondents strongly agree with mean value 3.616 and standard deviation 1.077. The result showed that majority of the respondents agreed that there is lack of commitment at hospital management level to solve the problems of the management of pharmaceutical inventory. The data obtained from interview also confirmed that there is lack of commitment at hospital management level to solve the problems of the management of pharmaceutical inventory.

According to the respondent's perception on the question, in this hospital there is bureaucratic process in procurement, 63.4% of them agreed, 16.1 % replied neutral, 4.5 strongly disagreed whereas 8% of them disagreed and strongly agreed with mean value of 3.625 and standard deviation of 1.278. These results indicated that the majority of the respondents agreed that there is bureaucratic process in procurement.

The finding from the interview indicated that order to identify the reasons of stock out majority of the respondents explained their perception that there are problems of selection, quantification, forecasting and procurement. In addition, long lead time, lack of accurate consumption data, limited capacity of EPSA to avail required pharmaceuticals, insufficient budget and weak pharmaceutical supply chain were the reasons for stock outs of pharmaceuticals according to most of the interviewees.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1. Introduction

This chapter presents a summary of the findings of the study, conclusion and recommendations concerning the study. Results and discussions in chapter four were the root for these conclusions and recommendations for the way forward in addressing the problem of pharmaceuticals inventory management practices and challenges at TikurAnbessa Specialized Hospital.

5.2. Summary of the Findings

From the data analysis of the study the major findings were obtained. The findings of the study that is related to the first objective of the study which focused on assessing the inventory management and control of the flow of stock and information of pharmaceuticals practiced at TikurAnbessa Specialized Hospital are summarized as follows. The hospital uses Health Commodity Management Information System (HCMIS)(3.589) , physical count of inventory is at regular basis(3.759), the hospital established procedures for placing emergency orders(3.821), use of ABC/VEN (Vital, Essential & Non-essential) analysis leads to efficient management of resources(3.759), obsolete & expired or damaged inventories properly identified and segregated(3.616), disposal of waste and expire of pharmaceuticals is according to the Disposal Guideline (3.759) each average mean values is greater than 3.5 which indicated that the respondents agreed the pharmaceutical inventory management of TASH practiced these indicators.

On the other hand, auditable pharmaceuticals transaction and services/APTS/ system of this hospital is automated (1.848) and adequate and detailed written inventory instructions and procedures exist (2.482) each average mean value indicated that they are in the range of 1.5 to 2.5 which implied that the respondents disagreed on these indicators so that auditable pharmaceuticals transaction and services/APTS/ system of this hospital isn't automated and adequate as well as detailed written inventory instructions and procedures is not available.

Moreover, consumption data is available for each pharmaceutical (2.723), Requisition & Re-supply Form /RRF/ is reported periodically (3.009), inventory procedures give appropriate consideration to the location and arrangement of inventories (3.143), the hospital maintains Maximum, Minimum, and Re-order levels for pharmaceuticals (3.250), there is list of essential pharmaceuticals (3.259), each dispensing unit fills properly and periodically the

Internal Facility Report and Re- supply Form/ IFRR/ to request and receive pharmaceuticals from the warehouse (3.411), the hospital uses periodical replenishment of stocks (3.286) each average mean value is in the range of 2.5 to 3.5 which implied that the respondents felt neutral so that these indicators are practiced at the moderate level.

The findings of the study that is related to the second objective of the study which focused on explaining the causes of stock out of pharmaceuticals at TASH are summarized as follows. Among the indicators stock out of pharmaceuticals occurs because the EPSA unable to fullfill the demand of the TASH (3.571) this average mean value is the range 3.5 to4.5 which implied that the respondents agreed so that stock out of pharmaceuticals occurs because the EPSA unable to fullfill the demand of the TASH.However, stock out of pharmaceuticals occurs because of pharmaceuticals' quantification problem(3.482),stock out of pharmaceuticals occurs because of pharmaceuticals' forecasting problem(3.482),stock out of pharmaceuticals occurs because of direct procurement from only EPSA/Pharmaceuticals Fund and Supply Agency/(3.446),stock out of pharmaceuticals occurs because of procurement problem(3.268),stock out of pharmaceuticals occurs because the EPSA unable to realize sustainable supply of pharmaceuticals to the TASH(3.277),stock out of pharmaceuticals occurs because the hospital allocates insufficient budget(3.161),stock out of pharmaceuticals occurs because of pharmaceuticals' selection problem(3.036) each average mean value is in the range 2.5 to 3.5 which implied that the respondents felt neutral so that these indicators are practiced at the moderate level.

On the other hand, the indicator stock out of pharmaceuticals occurs due to lack of trained man power on pharmaceutical inventory management (2.420) average mean value indicated that it is in the range of 1.5 to 2.5 which implied that the respondents disagreed so that there is no lack of trained man power on pharmaceutical inventory management and it isn't the cause of the stock out of pharmaceuticals.

In addition, the findings of the study that is related to the third objective of study which focused on identifying the aspects of pharmaceutical inventory management practices that need to be considered at TASH are summarized as follows. Integrated information sharing system is designed (1.973) average mean value indicated that it is in the range of 1.5 to 2.5 which implied that the respondents disagreed so thatintegrated information sharing system isn't designed. However, on Job training is given to the professionals that directly involved in pharmaceutical inventory management(2.500),the hospital is implementing the effective and

efficient selection, quantification, forecasting and procurement of pharmaceuticals(2.563),the pharmaceutical inventory management of this hospital is automated(2.670),there is reduction of waste and expire of pharmaceuticals(2.940)each average mean value is in the range 2.5 to 3.5 which implied that the respondents felt neutral so that these indicators are practiced at the moderate level.

The findings of the study that is related to the fourth objective of study which aimed at assessing the challenges related to inventory management of pharmaceuticals at TASH are summarized as follows. The indicators, there is frequent expire of pharmaceuticals (3.607),there is lack of commitment at hospital management level to solve the problems of the management of pharmaceutical inventory(3.616),there is bureaucratic process in procurement (3.625),delays in delivery of pharmaceuticals leads to insufficient inventories (3.884),overstock of pharmaceuticals is common (3.911),the hospital is using manual inventory management system/ there is lack of technology (3.938) each average mean value is in the range 3.5 to 4.5 which implied that the respondents agreed so that these indicators are the challenges of pharmaceutical inventory managementatTASH.

5.3 Conclusions

The following conclusions have been drawn on the bases of the findings of the data analysis. In this study, based on the result it can be concluded that there is lack of automatedauditable pharmaceuticals transaction and services/APTS/ system, insufficient budget, long lead time, lack of on job training, lack of the effective and efficient selection, quantification, forecasting and procurement of pharmaceuticals, and lack of integrated information sharing system are identified as the major gaps ofTASH on pharmaceutical inventory management practices. However, the hospital established procedures for placing emergency orders, use of ABC/VEN analysis, use of HCMIS,obsolete& expired or damaged inventories are properly identified and segregated& the disposal of these inventories is according to the Disposal Guideline and the hospital uses periodical replenishment of stocks were practiced at TASH pharmaceuticals inventory management.

The major aspects of pharmaceutical inventory management practices that are needed to be considered at TASH includes automation through technology, allocation of sufficient budget for the procurement, providingon job training to the professionals that directly involved in pharmaceutical inventory management, reduction of waste & expire of pharmaceuticalsanddevelopingintegrated information sharing system.

Based on the assessment conducted on assessing the challenges related to inventory management at TASH; lack of technology, overstock of pharmaceuticals, long lead time, long length of bureaucracy in procurement, lack of commitment at hospital management level to solve the problems of the management of pharmaceutical inventory and frequent expire of pharmaceuticals are challenging factors that are affecting the operational performance of pharmaceuticals inventory at the TASH.

5.4. Recommendations

Based on the study results and conclusions drawn from them, the following recommendations are suggested as a means of alleviating the problems found.

1. The study recommends that the hospital to strengthen HCMIS technologies which will lead to increased information sharing, reduction of wastages and costs, increased pharmaceuticals availability and improved quality of health services.
2. Periodical replenishment of stocks recommended to be based on consumption data which would prevent the expiry of pharmaceuticals
3. The hospital needs to implement the effective and efficient selection, quantification, forecasting and procurement of pharmaceuticals to enable the better management of inventory and enhance patient care by promoting the availability of pharmaceuticals.
4. On Job training needs to be given to the professionals that directly involved in pharmaceutical inventory management to enhance capacity building.
5. The hospital needs to reduce waste and expire of pharmaceuticals to decrease the cost and be efficient.
6. The hospital needs to manage the pharmaceuticals inventory through Integrated information sharing system with the suppliers
7. The hospital needs to allocate sufficient budget for the procurement in order to increase pharmaceuticals availability and patient care.
8. Bureaucratic procurement system needs to be improved.
9. Inventory management training needs to be given to improve the availability and the quality of services in TASH.

5.5 Limitation of the study

In the area of public hospital pharmaceutical inventory management, findings of this study are believed to fill the gaps for alleviating the problems. However, the study is limited to only on a single public hospital in Addis Ababa. Therefore, it didn't see the pharmaceutical inventory management practices and challenges of private sector studied for comparison. Moreover, the study didn't consider potential regional variations of pharmaceutical inventory management practices and challenges.

5.6. Directions for Future Research

Further study should be conducted in the other specialized referral hospitals to know the extent of implementation of inventory management practices in order to create a comparison on the findings upon which reliable conclusion can be made based on facts. In addition, it would be interesting to investigate the extent to which private hospitals implement inventory management practices and what public hospitals can learn, if anything, from them in relation to quality health care service delivery on efficient and effective inventory management. Moreover, future research might further evaluate other challenges and could be done on multiple hospitals and with large number of respondents to enhance the research findings.

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ADDIS ABABA UNIVERSITY
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DEPARTMENT OF LOGISTICS AND SUPPLY CHAIN MANAGEMENT

Annex I Questionnaire

Dear respondents: I'm a graduate student at Addis Ababa University School of Commerce in the Department of Logistics and Supply Chain Management. Currently, I'm conducting a research entitled 'Pharmaceutical inventory management practices: The case of TikurAnbesa Specialized Hospital' as a partial requirement for the award of Masters of Art Degree in Logistics and Supply Chain Management.

The purpose of this questionnaire is to gather data for the proposed study, and hence you are kindly requested to assist the successful completion of the study by providing the necessary information. Your participation is entirely voluntary and the questionnaire is completely anonymous. I confirm you that the information you share will stay confidential and solely used for academic purposes, thus not affects you in any way rather it may help you in improving the inventory management of your hospital. So, your genuine, frank and timely response is vital for the success of the study. I want to thank you in advance for your kind cooperation and dedication of your precious time to fill this questionnaire.

Do I have your permission?

a) Yes b) No

With Regards! Eshetu Kebede

Note:

1. No need of writing your name.
2. Indicate your answer with a **check mark** (✓) on the appropriate cell both for part I and II
3. If you need further explanation please do not hesitate to contact me through my personal phone +251913267122 or in person.

Part I. Socio Demographic

1. Sex Male Female

2. Age

18-25yrs 26-35 yrs 36-45 yrs 46-55yrs >55yrs

3. Educational Qualification

College Diploma First Degree
 Master's Degree PhD and Above

4. Profession

Pharmacist Laboratory technologist
 Nurse Sub specialist
 Specialist Other

5. Which department of the hospital do you work?

OPD Pharmacy Laboratory Ward Emergency

6. How long have you worked for the hospital?

Less than 1 year 1 – 3 years 4 – 6 years
 7 – 9 years 10 years and above

7. Current position you have in the work

Pharmacy Directorate Head
 Laboratory head
 Drug supply chain team leader
 Warehouse manager
 Drug supply chain team members
 Team coordinator (e.g. wards, pharmacy, OPD, laboratory)
 Others (e.g. pharmacy service, laboratory service, etc)

Part II: Pharmaceutical Inventory Management Practice & Challenges

Please choose the extent to which you agree with the following as practised at Tikur Anbessa Specialized Hospital (TASH)

You should rank each statement as follows

1. Strongly Disagree
2. Disagree
3. Neutral
4. Agree
5. Strongly Agree

	QUESTIONS	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
<i>1. Inventory management and control</i>						
1.1	The hospital maintains Maximum, Minimum, and Re-order levels for pharmaceuticals	[1]	[2]	[3]	[4]	[5]
1.2	There is list of essential pharmaceuticals	[1]	[2]	[3]	[4]	[5]
1.3	Inventory procedures give appropriate consideration to the location and arrangement of inventories	[1]	[2]	[3]	[4]	[5]
1.4	The hospital uses Health commodity management information system (HCMIS)	[1]	[2]	[3]	[4]	[5]
1.5	Adequate and detailed written inventory instructions and procedures exist	[1]	[2]	[3]	[4]	[5]
1.6	Auditable pharmaceuticals transaction and services/APTS/ system of this hospital is automated	[1]	[2]	[3]	[4]	[5]
1.7	Physical count of inventory is at regular basis	[1]	[2]	[3]	[4]	[5]
1.8	Management carry out review the reconciliation of physical inventory counts to the inventory records	[1]	[2]	[3]	[4]	[5]
1.9	The hospital established procedures for placing emergency orders	[1]	[2]	[3]	[4]	[5]
1.10	The hospital uses periodical replenishment of stocks	[1]	[2]	[3]	[4]	[5]

1.11	Each dispensing unit fills properly and periodically the Internal Facility Report and Re- supply Form/ IFRR/ to request and receive pharmaceuticals from the warehouse	[1]	[2]	[3]	[4]	[5]
1.12	The hospital uses ABC/VEN (Vital, Essential & Non-essential) analysis to classify items according to their stock value	[1]	[2]	[3]	[4]	[5]
1.13	Use of ABC/VEN (Vital, Essential & Non-essential) analysis leads to efficient management of resources	[1]	[2]	[3]	[4]	[5]
1.14	Obsolete, expired or damaged inventories properly identified and segregated	[1]	[2]	[3]	[4]	[5]
1.15	Disposal of waste and expire of pharmaceuticals is according to the Disposal Guideline	[1]	[2]	[3]	[4]	[5]
1.16	Requisition & Re- supply Form /RRF/ is reported periodically	[1]	[2]	[3]	[4]	[5]
1.17	Consumption data is available for each pharmaceutical	[1]	[2]	[3]	[4]	[5]
2. The reasons of the stock out of pharmaceuticals						
2.1	Stock out of pharmaceuticals occurs because of pharmaceuticals' selection problem	[1]	[2]	[3]	[4]	[5]
2.2	Stock out of pharmaceuticals occurs because of pharmaceuticals' quantification problem	[1]	[2]	[3]	[4]	[5]
2.3	Stock out of pharmaceuticals occurs because of pharmaceuticals' forecasting problem	[1]	[2]	[3]	[4]	[5]
2.4	Stock out of pharmaceuticals occurs because of procurement problem	[1]	[2]	[3]	[4]	[5]
2.5	Stock out of pharmaceuticals occurs because of direct procurement from only EPSA/Pharmaceuticals Fund and Supply Agency/	[1]	[2]	[3]	[4]	[5]
2.6	Stock out of pharmaceuticals occurs because the EPSA unable to fullfill the demand of the TASH.	[1]	[2]	[3]	[4]	[5]
2.7	Stock out of pharmaceuticals occurs because the EPSA unable to realize sustainable supply of pharmaceuticals to the TASH	[1]	[2]	[3]	[4]	[5]
2.8	Stock out of pharmaceuticals occurs because the hospital allocates insufficient budget	[1]	[2]	[3]	[4]	[5]
2.9	Stock out of pharmaceuticals occurs due to lack of trained man power on pharmaceutical inventory management	[1]	[2]	[3]	[4]	[5]
3. Aspects of pharmaceutical inventory management practices that need to be considered						
3.1	The pharmaceutical inventory management of this hospital is automated	[1]	[2]	[3]	[4]	[5]
3.2	Periodical replenishment of stocks is based on consumption data	[1]	[2]	[3]	[4]	[5]

3.3	The hospital is implementing the effective and efficient selection, quantification, forecasting and procurement of pharmaceuticals	[1]	[2]	[3]	[4]	[5]
3.4	On Job training is given to the professionals that directly involved in pharmaceutical inventory management	[1]	[2]	[3]	[4]	[5]
3.5	There is reduction of waste and expire of pharmaceuticals	[1]	[2]	[3]	[4]	[5]
3.6	Integrated information sharing system is designed	[1]	[2]	[3]	[4]	[5]
3.7	The hospital allocates sufficient budget for the procurement	[1]	[2]	[3]	[4]	[5]
3.8	There is ABC/VEN analysis reconciliation	[1]	[2]	[3]	[4]	[5]
4.Challenges of pharmaceutical inventory management at TASH						
4.1	Delays in delivery of pharmaceuticals leads to insufficient inventories	[1]	[2]	[3]	[4]	[5]
4.2	The hospital is using manual inventory management system/ there is lack of technology	[1]	[2]	[3]	[4]	[5]
4.3	In this hospital there is Bureaucratic process in procurement	[1]	[2]	[3]	[4]	[5]
4.4	The warehouses of the hospital have no enough space for the storage of pharmaceuticals	[1]	[2]	[3]	[4]	[5]
4.5	There is lack of commitment at hospital management level to solve the problems of the management of pharmaceutical inventory	[1]	[2]	[3]	[4]	[5]
4.6	The budget for the procurement is insufficient	[1]	[2]	[3]	[4]	[5]
4.7	Overstock of pharmaceuticals is common	[1]	[2]	[3]	[4]	[5]
4.8	There is frequent expire of pharmaceuticals	[1]	[2]	[3]	[4]	[5]
4.9	There is lack of proper training of inventory management	[1]	[2]	[3]	[4]	[5]
4.10	The stock out of essential medicine is a regular situation	[1]	[2]	[3]	[4]	[5]
4.11	Long time it takes your unit to receive pharmaceuticals once a request has been placed	[1]	[2]	[3]	[4]	[5]

Could you provide any suggestions for effective inventory management at TASH?.....
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Thank you very much!

Annex II Observation check list

Observation of inventory management pharmaceuticals at TASH

Description Yes/No Comments

1. Pharmaceuticals are selected, quantified, forecasted and procured. a) Yes b) No
2. There is inventory planning; RRF and Pharmaceuticals forecasting data are available.
 - a. Yes b) No
3. Pharmaceuticals inventory management follows first-to-expire, first-out (FEFO) counting and general management. a) Yes b) No
4. Pharmaceuticals inventory management of this facility uses HCMIS.
5. Damaged and/or expired pharmaceuticals are separated from usable pharmaceuticals and also are removed from inventory. a) Yes b) No
6. Storage area is secured with a lock and key, but is accessible during normal working hours; access is limited to authorized personnel. a) Yes b) No
7. Knowledge of responsible personnel about the method how to use HCMIS a) Yes b) No
8. There are overstocks a) Yes b) No
9. There are stock outs a) Yes b) No
10. There are expired items a) Yes b) No
11. Bin cards are available a) Yes b) No
12. Bin cards are updated a) Yes b) No
13. There are stock cards available? a) Yes b) No
14. The stock card match with the bin card? a) Yes b) No
15. There are written guideline for pharmaceuticals inventory management a) Yes b) No
16. The facility uses a minimum, maximum and reorder level for pharmaceuticals stock? a) Yes b) No
17. The hospital uses automatic stock tracking. a) Yes b) No

Thank you very much!

Annex III Interview Guide

- Q1. Does this facility apply any methods for periodic replenishment of stock?
- Q2. Are there long-term agreements between the hospital and its suppliers? If yes who is the supplier?
- Q3. Who is responsible for procurement & is that proper person? Why?
- Q4. Are there stocks out of pharmaceuticals at TASH? If yes what are the reasons of stock out & which type of pharmaceuticals are stock out?
- Q5. Are there count physical inventory at regular basis?
- Q6. Do you have anything to add to this interview regarding this topic?

Thank you very much!